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NEWS 1	NOV 21	Web Page for STN Seminar Schedule - N. America
NEWS 2		CAS patent coverage to include exemplified prophetic substances identified in English-, French-, German-, and Japanese-language basic patents from 2004-present
NEWS 3	NOV 26	MARPAT enhanced with FSORT command
NEWS 4	NOV 26	CHEMSAFE now available on STN Easy
NEWS 5	NOV 26	Two new SET commands increase convenience of STN searching
NEWS 6	DEC 01	ChemPort single article sales feature unavailable
NEWS 7	DEC 12	GBFULL now offers single source for full-text coverage of complete UK patent families
NEWS 8	DEC 17	Fifty-one pharmaceutical ingredients added to PS
NEWS 9	JAN 06	The retention policy for unread STNmail messages will change in 2009 for STN-Columbus and STN-Tokyo
NEWS 10	JAN 07	WPIDS, WPINDEX, and WPIX enhanced Japanese Patent Classification Data
NEWS 11	FEB 02	Simultaneous left and right truncation (SLART) added for CERAB, COMPUAB, ELCOM, and SOLIDSTATE
NEWS 12	FEB 02	GENBANK enhanced with SET PLURALS and SET SPELLING
NEWS 13	FEB 06	Patent sequence location (PSL) data added to USGENE
NEWS 14	FEB 10	COMPENDEX reloaded and enhanced
NEWS 15	FEB 11	WTEXTILES reloaded and enhanced
NEWS 16	FEB 19	New patent-examiner citations in 300,000 CA/CAplus patent records provide insights into related prior art
NEWS 17	FEB 19	Increase the precision of your patent queries -- use terms from the IPC Thesaurus, Version 2009.01
NEWS 18	FEB 23	Several formats for image display and print options discontinued in USPATFULL and USPAT2
NEWS 19	FEB 23	MEDLINE now offers more precise author group fields and 2009 MeSH terms
NEWS 20	FEB 23	TOXCENTER updates mirror those of MEDLINE - more precise author group fields and 2009 MeSH terms
NEWS 21	FEB 23	Three million new patent records blast AEROSPACE into STN patent clusters
NEWS 22	FEB 25	USGENE enhanced with patent family and legal status display data from INPADOCDB
NEWS 23	MAR 06	INPADOCDB and INPAFAMDB enhanced with new display formats
NEWS 24	MAR 11	EPFULL backfile enhanced with additional full-text applications and grants
NEWS 25	MAR 11	ESBIOBASE reloaded and enhanced
NEWS 26	MAR 20	CAS databases on STN enhanced with new super role for nanomaterial substances
NEWS 27	MAR 23	CA/CAplus enhanced with more than 250,000 patent equivalents from China

NEWS EXPRESS JUNE 27 08 CURRENT WINDOWS VERSION IS V8.3,  
AND CURRENT DISCOVER FILE IS DATED 23 JUNE 2008.

NEWS HOURS	STN Operating Hours Plus Help Desk Availability
NEWS LOGIN	Welcome Banner and News Items
NEWS IPC8	For general information regarding STN implementation of IPC 8

Enter NEWS followed by the item number or name to see news on that specific topic.

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CA INDEXING COPYRIGHT (C) 2009 AMERICAN CHEMICAL SOCIETY (ACS)

FILE 'USPATOLD' ENTERED AT 11:03:21 ON 26 MAR 2009  
CA INDEXING COPYRIGHT (C) 2009 AMERICAN CHEMICAL SOCIETY (ACS)

FILE 'USPAT2' ENTERED AT 11:03:21 ON 26 MAR 2009  
CA INDEXING COPYRIGHT (C) 2009 AMERICAN CHEMICAL SOCIETY (ACS)

FILE 'EPFULL' ENTERED AT 11:03:21 ON 26 MAR 2009  
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FILE 'GBFULL' ENTERED AT 11:03:21 ON 26 MAR 2009  
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=> e johnson a david/au,in  
'AU' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'MARPAT'  
'IN' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'MARPAT'

```
'IN' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'SCISEARCH'
E1      1      JOHNSON A D W/IN
E2      9      JOHNSON A DANIEL/AU
E3      57 --> JOHNSON A DAVID/AU
E4      49      JOHNSON A DAVID/IN
E5      9      JOHNSON A DOYLE/AU
E6      595     JOHNSON A E/AU
E7      94      JOHNSON A E/IN
E8      3      JOHNSON A E JR/AU
E9      2      JOHNSON A E JR/IN
E10     2      JOHNSON A E M/AU
E11     16     JOHNSON A EARL/AU
E12     445     JOHNSON A F/AU
```

The indicated field code is not available for EXPAND in this file. To see a list of valid EXPAND field codes, enter HELP SFIELDS at an arrow prompt (=>).

```
=> s e3-e4
'IN' IS NOT A VALID FIELD CODE
'AU' IS NOT A VALID FIELD CODE
'IN' IS NOT A VALID FIELD CODE
L1      57 ("JOHNSON A DAVID"/AU OR "JOHNSON A DAVID"/IN)
```

```
=> e bokaie michael/au,in
'AU' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'MARPAT'
'IN' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'MARPAT'
'IN' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'SCISEARCH'
E1      1      BOKAIE J/AU
E2      1      BOKAIE J/IN
E3      4 --> BOKAIE MICHAEL/AU
E4      4      BOKAIE MICHAEL/IN
E5      3      BOKAIE MICHAEL D/AU
E6      3      BOKAIE MICHAEL D/IN
E7      1      BOKAIE P BARADAR/AU
E8      13     BOKAIE S/AU
E9      1      BOKAIE S/IN
E10     1      BOKAIE SAEED/AU
E11     2      BOKAIE SAIED/AU
E12     1      BOKAIR/AU
```

The indicated field code is not available for EXPAND in this file. To see a list of valid EXPAND field codes, enter HELP SFIELDS at an arrow prompt (=>).

```
=> s e3-e6
'IN' IS NOT A VALID FIELD CODE
'AU' IS NOT A VALID FIELD CODE
'IN' IS NOT A VALID FIELD CODE
L2      7  ("BOKAIE MICHAEL"/AU OR "BOKAIE MICHAEL"/IN OR "BOKAIE MICHAEL
          D"/AU OR "BOKAIE MICHAEL D"/IN)
```

```
=> e martynov valery/au,in
'AU' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'MARPAT'
'IN' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'MARPAT'
'IN' IS NOT A VALID EXPAND FIELD CODE FOR FILE 'SCISEARCH'
E1      1      MARTYNOV VALERIJ V/AU
E2      1      MARTYNOV VALERIJ V/IN
E3      27     --> MARTYNOV VALERY/AU
E4      25     MARTYNOV VALERY/IN
E5      1      MARTYNOV VALERY DMITRIEVICH/AU
E6      1      MARTYNOV VALERY DMITRIEVICH/IN
E7      2      MARTYNOV VALERY N/AU
E8      7      MARTYNOV VALERY V/AU
```

E9 6 MARTYNOV VALERY V/IN  
E10 1 MARTYNOV VICTOR V/AU  
E11 1 MARTYNOV VIKTOR A/AU  
E12 1 MARTYNOV VIKTOR A/IN

The indicated field code is not available for EXPAND in this file. To see a list of valid EXPAND field codes, enter HELP SFIELDS at an arrow prompt (=>).

=> s e3-e9  
'IN' IS NOT A VALID FIELD CODE  
'AU' IS NOT A VALID FIELD CODE  
'IN' IS NOT A VALID FIELD CODE  
L3 37 ("MARTYNOV VALERY"/AU OR "MARTYNOV VALERY"/IN OR "MARTYNOV VALERY DMITRIEVICH"/AU OR "MARTYNOV VALERY DMITRIEVICH"/IN OR "MARTYNOV VALERY N"/AU OR "MARTYNOV VALERY V"/AU OR "MARTYNOV VALERY V"/IN)

=> s (l1 or l2 or l3)  
L4 69 (L1 OR L2 OR L3)

=> dup rem l4  
PROCESSING COMPLETED FOR L4  
L5 50 DUP REM L4 (19 DUPLICATES REMOVED)

=> d 15 1-50 ibib,abs

L5 ANSWER 1 OF 50 USPATFULL on STN  
ACCESSION NUMBER: 2008:245098 USPATFULL  
TITLE: CONSTANT LOAD FASTENER  
INVENTOR(S): Johnson, Alfred David, San Leandro, CA, UNITED STATES  
Bokaie, Michael D., San Rafael, CA, UNITED  
STATES  
Martynov, Valery, San Francisco, CA, UNITED  
STATES  
PATENT ASSIGNEE(S): TINI ALLOY COMPANY, San Leandro, CA, UNITED STATES  
(U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20080213062	A1	20080904
APPLICATION INFO.:	US 2007-859697	A1	20070921 (11)
RELATED APPLN. INFO.:	Continuation-in-part of Ser. No. US 2006-526138, filed on 22 Sep 2006, PENDING		

DOCUMENT TYPE: Utility  
FILE SEGMENT: APPLICATION  
LEGAL REPRESENTATIVE: SHAY GLENN LLP, 2755 CAMPUS DRIVE, SUITE 210, SAN  
MATEO, CA, 94403, US

NUMBER OF CLAIMS: 22  
EXEMPLARY CLAIM: 1  
NUMBER OF DRAWINGS: 3 Drawing Page(s)  
LINE COUNT: 507

AB Described herein are fasteners and devices for securing together several components so that the load applied to the components is constant or nearly constant. The fasteners described herein include a hyperelastic member having first end to which a first retainer is coupled and a second end to which a second retainer is coupled. The retainers are configured to contact the structures being fastened and transfer the load from the structures to the hyperelastic member. The hyperelastic member may be an elongate shaft (e.g., a rod, cylinder, strut, etc.), and is a shape memory alloy that is typically fabricated as a single crystal.

L5 ANSWER 2 OF 50 USPATFULL on STN  
 ACCESSION NUMBER: 2008:86360 USPATFULL  
 TITLE: Constant load bolt  
 INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES  
 Bokaie, Michael, San Leandro, CA, UNITED STATES  
 Martynov, Valery, San Francisco, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20080075557	A1	20080327
APPLICATION INFO.:	US 2006-526138	A1	20060922 (11)
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	APPLICATION		
LEGAL REPRESENTATIVE:	SHAY GLENN LLP, 2755 CAMPUS DRIVE, SUITE 210, SAN MATEO, CA, 94403, US		
NUMBER OF CLAIMS:	5		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	3 Drawing Page(s)		
LINE COUNT:	176		

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Devices and methods for making fasteners, such as bolts, having one or more components made of single crystal shape memory alloy capable of large recoverable distortions, and in particular having a plateau in the stress-strain relationship. A constant load is applied by a bolt that is tightened until the force exerted by the bolt is equal to the stress multiplied by the cross-section of a tension component in the bolt. Increasing or decreasing the length of the tension component by as much as several percent causes a negligible change in the load.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L5 ANSWER 3 OF 50 USPATFULL on STN  
 ACCESSION NUMBER: 2008:301034 USPATFULL  
 TITLE: Eyeglass frame  
 INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES  
 PATENT ASSIGNEE(S): TiNi Alloy Company, San Leandro, CA, UNITED STATES  
 (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 7441888	B1	20081028
APPLICATION INFO.:	US 2006-415885		20060502 (11)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2005-678921P	20050509 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	GRANTED	
PRIMARY EXAMINER:	Dang, Hung X	
LEGAL REPRESENTATIVE:	Shay Glenn LLP	
NUMBER OF CLAIMS:	5	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	4 Drawing Figure(s); 3 Drawing Page(s)	
LINE COUNT:	317	

AB Eyeglass frame hinges are replaced by flexures made of hyperelastic single-crystal shape memory alloy. These flexures exhibit more than 8 percent recoverable strain. Eyeglass frames with these flexures can be

distorted repeatedly in ways that would destroy ordinary hinges, and recover without damage. Flexures may be incorporated in eyeglass frames in ways that make them attractive as fashion items, thus enhancing the value of a commodity consumer product.

L5 ANSWER 4 OF 50 USPATFULL on STN  
ACCESSION NUMBER: 2008:248754 USPATFULL  
TITLE: Non-explosive releasable coupling device  
INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES  
                  Bokaie, Michael, San Rafael, CA, UNITED STATES  
                  Martynov, Valery, San Francisco, CA, UNITED STATES  
PATENT ASSIGNEE(S): Tini Alloy Company, San Leandro, CA, UNITED STATES  
(U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 7422403	B1	20080909
APPLICATION INFO.:	US 2004-972745		20041025 (10)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2003-513936P	20031023 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	GRANTED	
PRIMARY EXAMINER:	Saether, Flemming	
LEGAL REPRESENTATIVE:	Shay Glenn LLP	
NUMBER OF CLAIMS:	5	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	1 Drawing Figure(s); 1 Drawing Page(s)	
LINE COUNT:	212	

AB A device and method for holding or clamping components together, and with the clamping being selectively loosened to permit the components to move through a predetermined distance without being fully released. A bolt has its head end attached to one component and its threaded end attached to the other component. A portion of the bolt's shank is formed with a necked-down portion. An actuator of shape memory alloy material is mounted about the bolt. When energized by heat, the actuator expands and exerts a great force which stretches the bolt, permanently deforming the bolt. This enables limited movement of the components while still restraining them from separating.

L5 ANSWER 5 OF 50 EPFULL COPYRIGHT 2009 EPO/FIZ KA/LNU on STN

ACCESSION NUMBER: 2008:12870 EPFULL  
ENTRY DATE PATENT: 20080917  
ENTRY DATE PUBLICATION: 20080917  
UPDATE DATE PUBLICAT.: 20080917  
DATA UPDATE DATE: 20080917  
DATA UPDATE WEEK: 200838  
TITLE (ENGLISH): FRANGIBLE SHAPE MEMORY ALLOY FIRE SPRINKLER VALVE  
ACTUATOR  
TITLE (FRENCH): ACTIONNEUR DE VANNE D'EXTINCTEUR EN ALLIAGE A MEMOIRE  
DE FORME FRAGILE  
INVENTOR(S): JOHNSON, A., David, 13003 Neptune Drive, San  
Leandro, CA 94577, US; GILBERTSON, Roger, Graham,  
45 Verissimo Drive, Novato, CA 94947, US;  
MARTYNOV, Valery, 335 18th Avenue, San Francisco, CA

PATENT APPLICANT(S): 94121, US  
TINI ALLOY COMPANY, 13003 Neptune Drive, San Leandro,  
CA 94577, US

PATENT APPL. NUMBER: 7732590

DOCUMENT TYPE: Patent

LANGUAGE OF FILING: English

LANGUAGE OF PUBL.: English

LANGUAGE OF PROCEDURE: English

LANGUAGE OF TITLE: English; French

PATENT INFO TYPE: WOAI International application published with search report

PATENT INFORMATION:

	NUMBER	KIND	DATE
DESIGNATED STATES:	WO 2008092028	A1	20080731
	AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR		
EXTENSION STATES:	AL BA MK RS		
APPLICATION INFO.:	EP 2008-713980	A	20080124
	WO 2008-US51949	A	20080124
PRIORITY INFO.:	US 2007-897708P	P	20070125

L5 ANSWER 6 OF 50 EPFULL COPYRIGHT 2009 EPO/FIZ KA/LNU on STN

ACCESSION NUMBER: 2007:116564 EPFULL

ENTRY DATE PATENT: 20080521

ENTRY DATE PUBLICATION: 20080521

UPDATE DATE PUBLICAT.: 20080521

DATA UPDATE DATE: 20080521

DATA UPDATE WEEK: 200821

TITLE (ENGLISH): CONSTANT LOAD FASTENER

TITLE (FRENCH): ATTACHE A CHARGE CONSTANTE

INVENTOR(S): JOHNSON, Alfred, David, 13003 Neptune Drive, San Leandro, CA 94577, US; BOKAIE, Michael, D., 30 Mountain View, San Refael, CA 94901, US; MARTYNOV, Valery, 335 18th Avenue, San Francisco, CA 94121, US

PATENT APPLICANT(S): TINI ALLOY COMPANY, 13003 Neptune Drive, San Leandro, CA 94577, US

PATENT APPL. NUMBER: 7732590

DOCUMENT TYPE: Patent

LANGUAGE OF FILING: English

LANGUAGE OF PUBL.: English

LANGUAGE OF PROCEDURE: English

LANGUAGE OF TITLE: English; French

PATENT INFO TYPE: WOAI International application published without search report

PATENT INFORMATION:

	NUMBER	KIND	DATE
DESIGNATED STATES:	WO 2008036952	A2	20080327
	AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR		
EXTENSION STATES:	AL BA HR MK RS		
APPLICATION INFO.:	EP 2007-843022	A	20070921
	WO 2007-US79241	A	20070921
PRIORITY INFO.:	US 2006-526138	A	20060922

L5 ANSWER 7 OF 50 EPFULL COPYRIGHT 2009 EPO/FIZ KA/LNU on STN

ACCESSION NUMBER: 2005:174677 EPFULL

ENTRY DATE PATENT: 20070523

ENTRY DATE PUBLICATION: 20080102  
UPDATE DATE PUBLICAT.: 20080402  
DATA UPDATE DATE: 20080402  
DATA UPDATE WEEK: 200814  
TITLE (ENGLISH): SELF-EXPANDABLE AND COLLAPSIBLE THREE-DIMENSIONAL DEVICES AND METHODS  
TITLE (FRENCH): DISPOSITIFS TRIDIMENSIONNELS AUTO-DEPLOYABLES ET ESCAMOTABLES ET PROCEDES DE FABRICATION  
TITLE (GERMAN): AUTOMATISCH AUFWEITBARE UND ZUSAMMENLEGBARE DREIDIMENSIONALE VORRICHTUNGEN UND VERFAHREN  
INVENTOR(S): GUPTA, Vikas, 1513 Vista Grand Drive, San Leandro, California 94577, US; JOHNSON, David A., 13003 Neptune Drive, San Leandro, California 94577, US; MENCHACA, Leticia, 1126 Delaware Street, Berkeley, California 94702, US; MARTYNOW, Valery, 335 18th Street, San Francisco, California 94121, US  
PATENT APPLICANT(S): TINI ALLOY COMPANY, 1619 Neptune Drive, San Leandro, CA 94577, US  
PATENT APPL. NUMBER: 7345300  
AGENT: Price, Nigel John King, J.A. KEMP & CO. 14 South Square Gray's Inn, London WC1R 5JJ, GB  
AGENT NUMBER: 62102  
DOCUMENT TYPE: Patent  
LANGUAGE OF FILING: English  
LANGUAGE OF PUBL.: English  
LANGUAGE OF PROCEDURE: English  
LANGUAGE OF TITLE: German; English; French  
PATENT INFO TYPE: EPA2 Application published without search report  
PATENT INFORMATION:  
PATENT INFORMATION:

NUMBER	KIND	DATE
NUMBER	KIND	DATE

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EP 1871288 A2 20080102

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WO 2005122714 20051229

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT  
LI LT LU MC NL PL PT RO SE SI SK TR

EP 2005-756151 A 20050601

WO 2005-US19078 A 20050601

US 2004-577774P P 20040608

L5 ANSWER 8 OF 50 USPATFULL on STN  
ACCESSION NUMBER: 2007:281690 USPATFULL  
TITLE: Thermal actuator for fire protection sprinkler head  
INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES

NUMBER	KIND	DATE
NUMBER	KIND	DATE

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US 20070246233 A1 20071025

APPLICATION INFO.: US 2007-731508 A1 20070329 (11)

NUMBER	DATE
NUMBER	DATE

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US 2006-788866P 20060404 (60)

PRIORITY INFORMATION: Utility

DOCUMENT TYPE: APPLICATION

FILE SEGMENT: SHAY LAW GROUP LLP, 2755 CAMPUS DRIVE, SUITE 210, SAN MATEO, CA, 94403, US  
LEGAL REPRESENTATIVE:

NUMBER OF CLAIMS: 18

EXEMPLARY CLAIM: 1

NUMBER OF DRAWINGS: 2 Drawing Page(s)  
LINE COUNT: 259

AB A thermally actuated valve assembly. In some embodiments, the assembly includes a source of pressurized fluid, the source having an outlet; a valve at the outlet; a strut maintaining the valve closed against force applied by the pressurized fluid; and a thermal actuator formed at least in part from shape memory material, the thermal actuator being movable from a first shape permitting the strut to maintain the valve closed and a second shape applying force to move the strut, thereby permitting the pressurized fluid to open the valve.

L5 ANSWER 9 OF 50 USPATFULL on STN  
ACCESSION NUMBER: 2007158201 USPATFULL  
TITLE: Single crystal shape memory alloy devices and methods  
INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED  
STATES  
Bokaie, Michael, San Leandro, CA, UNITED  
STATES  
Martynov, Valery, San Francisco, CA, UNITED  
STATES  
PATENT ASSIGNEE(S): ATINI ALLOY COMPANY, SAN LEANDRO, CALIFORNIA, CANADA,  
94577 (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20070137740	A1	20070621
APPLICATION INFO.:	US 2005-588413	A1	20050504 (10)
	WO 2005-US15703		20050504
			20060731 PCT 371 date

	NUMBER	DATE
PRIORITY INFORMATION:	US 2005-11041185	20050124
	US 2004-569659P	20040506 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	Richard E Backus, 887 28th Avenue, San Francisco, CA, 94121, US	
NUMBER OF CLAIMS:	49	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	10 Drawing Page(s)	
LINE COUNT:	1256	

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Devices and methods of making devices having one or more components made of single crystal shape memory alloy capable of large recoverable distortions, defined herein as "hyperelastic" SMA. Recoverable Strains are as large as 9 percent, and in special circumstances as large as 22 percent. Hyperelastic SMAs exhibit no creep or gradual change during repeated cycling because there are no crystal boundaries. Hyperelastic properties are inherent in the single crystal as formed: no cold work or special heat treatment is necessary. Alloy components are Cu--Al--X where X may be Ni, Fe, Co, Mn. Single crystals are pulled from melt as in the Stepanov method and quenched by rapid cooling to prevent selective precipitation of individual elemental components. Conventional methods of finishing are used: milling, turning, electro-discharge machining, abrasion. Fields of application include aerospace, military, automotive, medical devices, microelectronics, and consumer products.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

ACCESSION NUMBER: 2005:50930 EPFULL  
 ENTRY DATE PATENT: 20060217  
 ENTRY DATE PUBLICATION: 20070201  
 UPDATE DATE PUBLICAT.: 20070816  
 DATA UPDATE DATE: 20070815  
 DATA UPDATE WEEK: 200733  
 TITLE (ENGLISH): SINGLE CRYSTAL SHAPE MEMORY ALLOY DEVICES AND METHODS  
 DISPOSITIFS ET PROCEDES PERMETTANT DE FABRIQUER DES  
 COMPOSANTS CONSTITUES D'UN ALLIAGE A MEMOIRE DE FORME  
 MONOCRISTALLIN  
 TITLE (GERMAN): VORRICHTUNGEN UND VERFAHREN UNTER VERWENDUNG VON  
 EINKRISTALL-FORMGEDAeCHTNISLEGIERUNGEN  
 INVENTOR(S): JOHNSON, David A., 2235 Polvorosa Street, San Leandro,  
 CA 94577, US; BOKAIE, Michael, 2235 Polvorosa  
 Street, San Leandro, CA 94577, US; MARTYNOW,  
 Valery, 335-18th Street, San Francisco, CA 94121, US  
 PATENT APPLICANT(S): TINI ALLOY COMPANY, 13003 Neptune Drive, San Leandro,  
 CA 94577, US  
 PATENT APPL. NUMBER: 7732590  
 AGENT: Price, Nigel John King, J.A. KEMP & CO. 14 South Square  
 Gray's Inn, London WC1R 5JJ, GB  
 AGENT NUMBER: 62102  
 DOCUMENT TYPE: Patent  
 LANGUAGE OF FILING: English  
 LANGUAGE OF PUBL.: English  
 LANGUAGE OF PROCEDURE: English  
 LANGUAGE OF TITLE: German; English; French  
 PATENT INFO TYPE: EPA2 Application published without search report  
 PATENT INFORMATION:  
 PATENT INFORMATION:

NUMBER	KIND	DATE
NUMBER	KIND	DATE
EP 1747299	A2	20070131
WO 2005108635		20051117
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR		
EP 2005-744403	A	20050504
WO 2005-US15703	A	20050504
US 2004-569659P	P	20040506
US 2005-41185	A	20050124

DESIGNATED STATES: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT  
 LI LT LU MC NL PL PT RO SE SI SK TR  
 APPLICATION INFO.: EP 2005-744403 A 20050504  
 WO 2005-US15703 A 20050504  
 PRIORITY INFO.: US 2004-569659P P 20040506  
 US 2005-41185 A 20050124

L5 ANSWER 11 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 1  
 ACCESSION NUMBER: 2006:544810 HCPLUS  
 DOCUMENT NUMBER: 145:34347  
 TITLE: Portable energy storage devices with a shape memory  
 alloy component for knee prosthetics  
 INVENTOR(S): Johnson, A. David  
 PATENT ASSIGNEE(S): USA  
 SOURCE: U.S. Pat. Appl. Publ., 15 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 20060118210	A1	20060608	US 2005-243519	20051004
PRIORITY APPLN. INFO.:			US 2004-615846P	P 20041004

US 2004-637741P P 20041122  
US 2005-658862P P 20050307

AB Devices and methods which store and selectively release relatively substantial amts. of energy for enabling individuals to undertake superior performance in locomotion and other phys. activities. The different embodiments include a hyperelastic shape memory alloy (SMA) element which stores and releases energy in a differential pulley set, in a hinged knee, and in a pogo stick. The shape memory alloy is Cu-12Al-3Ni.

L5 ANSWER 12 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 2

ACCESSION NUMBER: 2006:432609 HCPLUS

DOCUMENT NUMBER: 144:440171

TITLE: Thin film shape memory alloy intrauterine device

INVENTOR(S): Menchaca, Leticia; Johnson, David A.; Gupta, Vikas; Martynov, Valery

PATENT ASSIGNEE(S): Tini Alloy CO., USA

SOURCE: U.S., 6 pp.

CODEN: USXXAM

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 7040323	B1	20060509	US 2003-638282	20030807
US 20060213522	A1	20060928	US 2006-392998	20060330
PRIORITY APPLN. INFO.:			US 2002-402418P	P 20020808
			US 2003-638282	A3 20030807

AB Contraceptive intrauterine devices are made of thin film shape memory alloy materials. The devices are formed in three-dimensional shapes which contact uterus tissue of a human or other mammal to prevent conception. In certain embodiments, structural features such as tails, fenestrations, ridges or grooves are formed on the devices to enhance the contraceptive effect.

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 13 OF 50 USPATFULL on STN

ACCESSION NUMBER: 2006:272585 USPATFULL

TITLE: Tear-resistant thin film methods of fabrication

INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES

NUMBER	KIND	DATE
PATENT INFORMATION: US 20060232374	A1	20061019
APPLICATION INFO.: US 2006-396234	A1	20060331 (11)

NUMBER	DATE
PRIORITY INFORMATION: US 2005-666325P	20050331 (60)
	US 2005-678921P 20050509 (60)

DOCUMENT TYPE: Utility

FILE SEGMENT: APPLICATION

LEGAL REPRESENTATIVE: Law Offices of Richard E. Backus, 887 - 28th Ave., San Francisco, CA, 94121, US

NUMBER OF CLAIMS: 8

EXEMPLARY CLAIM: 1

NUMBER OF DRAWINGS: 2 Drawing Page(s)

LINE COUNT: 233

AB A thin film device and fabrication method providing optimum tear

resistance. A thin film layer is formed with a first and second of rows of holes. The holes in each row are spaced-apart along an axis which extends along an edge of the layer. The holes in one row are in overlapping relationship with adjacent holes in the other row. The holes have a diameter which is sufficiently large so that an imaginary line extending perpendicular from any location along the edge will intersect at least one hole, thus preventing further propagation of any tears or cracks which start from the edge.

L5 ANSWER 14 OF 50 USPATFULL on STN  
 ACCESSION NUMBER: 2006:251080 USPATFULL  
 TITLE: Thin film intrauterine device  
 INVENTOR(S): Menchaca, Leticia, Berkeley, CA, UNITED STATES  
 Johnson, A. David, San Leandro, CA, UNITED STATES  
 Gupta, Vikas, San Leandro, CA, UNITED STATES  
 Martynov, Valery, San Francisco, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20060213522	A1	20060928
APPLICATION INFO.:	US 2006-392998	A1	20060330 (11)
RELATED APPLN. INFO.:	Division of Ser. No. US 2003-638282, filed on 7 Aug 2003, GRANTED, Pat. No. US 7040323		

	NUMBER	DATE
PRIORITY INFORMATION:	US 2002-402418P	20020808 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	Richard E. Backus, 887 - 28th Ave., San Francisco, CA, 94121, US	
NUMBER OF CLAIMS:	19	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	2 Drawing Page(s)	
LINE COUNT:	323	

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB Contraceptive intrauterine devices made of thin film shape memory alloy materials. The devices are formed in three-dimensional shapes which contact uterus tissue of a human or other mammal to prevent conception. In certain embodiments, structural features such as tails, fenestrations, ridges or grooves are formed on the devices to enhance the contraceptive effect.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L5 ANSWER 15 OF 50 HCAPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 3  
 ACCESSION NUMBER: 2005:1113383 HCAPLUS  
 TITLE: Zinc-air battery control valve  
 INVENTOR(S): Johnson, A. David  
 PATENT ASSIGNEE(S): Tini Alloy Company, USA  
 SOURCE: U.S., 13 pp.  
 CODEN: USXXAM  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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US 6955187 B1 20051018 US 2003-623139 20030716  
 PRIORITY APPLN. INFO.: US 2003-623139 20030716  
 AB A zinc-air battery and control valve for controlling air flow to energize the battery. Telescoping inner and outer valve sleeves each have a plurality of openings that when aligned communicate air from the exterior to the interior of the valve. Two actuators are provided, one to open the valve and the other to close it. All of the openings are opened or closed simultaneously by sliding motion of the valve sleeves that fit concentrically together. A bistable latching mechanism is provided to keep the valve in either of its two positions. A pair of switches operate in coordination with the latching mechanism so that a closed circuit is established for changing the state from that which was last established.  
 REFERENCE COUNT: 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 16 OF 50 USPATFULL on STN  
 ACCESSION NUMBER: 2005:184410 USPATFULL  
 TITLE: Method for sputtering TiNi shape-memory alloys  
 INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES  
                   Martynov, Valery V., San Francisco, CA,  
                   UNITED STATES  
                   Gupta, Vikas, San Leandro, CA, UNITED STATES  
                   Bose, Arani, New York City, NY, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20050159808	A1	20050721
APPLICATION INFO.:	US 2004-27814	A1	20041228 (11)
RELATED APPLN. INFO.:	Continuation of Ser. No. US 2003-345782, filed on 16 Jan 2003, ABANDONED Division of Ser. No. US 2001-768700, filed on 24 Jan 2001, GRANTED, Pat. No. US 6533905		

	NUMBER	DATE
PRIORITY INFORMATION:	US 2000-177881P	20000124 (60)
	US 2000-211352P	20000613 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	VIDAS, ARRETT & STEINKRAUS, P.A., 6109 BLUE CIRCLE DRIVE, SUITE 2000, MINNETONKA, MN, 55343-9185, US	
NUMBER OF CLAIMS:	18	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	4 Drawing Page(s)	
LINE COUNT:	535	

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A thin film device, such as an intravascular stent, is disclosed. The device is formed of a seamless expanse of thin-film (i) formed of a sputtered nitinol shape memory alloy, defining, in an austenitic state, an open, interior volume, having a thickness between 0.5-50 microns, having an austenite finish temperature A<sub>sub</sub>f below 37° C.; and demonstrating a stress/strain recovery greater than 3% at 37° C. The expanse can be deformed into a substantially compacted configuration in a martensitic state, and assumes, in its austenitic state, a shape defining such open, interior volume. Also disclosed is a sputtering method for forming the device.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

ACCESSION NUMBER: 2003:76402 EPFULL  
 ENTRY DATE PUBLICATION: 20050525  
 UPDATE DATE PUBLICAT.: 20070926  
 DATA UPDATE DATE: 20070926  
 DATA UPDATE WEEK: 200739  
 TITLE (ENGLISH): THREE DIMENSIONAL THIN FILM DEVICES AND METHODS OF FABRICATION  
 TITLE (FRENCH): DISPOSITIFS A FILMS MINCES TRIDIMENSIONNELS ET PROCEDES DE FABRICATION  
 TITLE (GERMAN): DREIDIMENSIONALE DUeNNFILMBAUELEMENTE UND HERSTELLUNGSVERFAHREN  
 INVENTOR(S): GUPTA, Vikas, 1513 Vista Grand Drive, San Leandro, CA 94577, US; JOHNSON, David, A., 1619 Neptune Drive, San Leandro, CA 94577, US; MENCHACA, Leticia, 1126 Delaware Street, Berkeley, CA 94702, US; MARTYNOW, Valery, 335 - 18th Avenue, San Francisco, CA 94121, US  
 PATENT APPLICANT(S): TINI ALLOY COMPANY, 1621 Neptune Drive, San Leandro, CA 94577, US  
 PATENT APPL. NUMBER: 1322721  
 AGENT: Powell, Stephen David, et al, WILLIAMS POWELL Morley House 26-30 Holborn Viaduct, London EC1A 2BP, GB  
 AGENT NUMBER: 52311  
 DOCUMENT TYPE: Patent  
 LANGUAGE OF FILING: English  
 LANGUAGE OF PUBL.: English  
 LANGUAGE OF PROCEDURE: English  
 LANGUAGE OF TITLE: German; English; French  
 PATENT INFO TYPE: EPA1 Application published with search report  
 PATENT INFORMATION:  
 PATENT INFORMATION:

NUMBER	KIND	DATE
NUMBER	KIND	DATE
EP 1532663	A1	20050525
WO 2004008504		20040122
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR		
EP 2003-764605	A	20030715
WO 2003-US21931	A	20030715
US 2002-198654	A	20020717

DESIGNATED STATES: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI  
LU MC NL PT RO SE SI SK TR  
 APPLICATION INFO.: EP 2003-764605 A 20030715  
 WO 2003-US21931 A 20030715  
 PRIORITY INFO.: US 2002-198654 A 20020717

L5 ANSWER 18 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN  
 ACCESSION NUMBER: 2005:430662 HCPLUS  
 DOCUMENT NUMBER: 143:122984  
 TITLE: Thermomechanical high-density data storage in a metallic material via the shape-memory effect  
 AUTHOR(S): Shaw, Gordon A.; Trethewey, Jeremy S.; Johnson, A. David; Drugan, Walter J.; Crone, Wendy C.  
 CORPORATE SOURCE: Department of Chemistry, University of Wisconsin-Madison, Madison, WI, 53706, USA  
 SOURCE: Advanced Materials (Weinheim, Germany) (2005), 17(9), 1123-1127  
 PUBLISHER: CODEN: ADVMEW; ISSN: 0935-9648  
 DOCUMENT TYPE: Wiley-VCH Verlag GmbH & Co. KGaA  
 LANGUAGE: Journal  
 English  
 AB By exploiting the shape-memory effect in NiTi, it is demonstrated for the first time that a metallic material can be used for rewriteable, thermomech. data storage. Data are written as surface indentations by a nanoscale mech. probe, read by a transducer, and erased by heating. A data array with a storage d. of 10 Gbit in.-2 (.apprx.6500 nm<sup>2</sup> bit<sup>-1</sup>) is

demonstrated but much higher storage densities are attainable with improved film planarity.

REFERENCE COUNT: 30 THERE ARE 30 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 19 OF 50 HCAPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 4  
ACCESSION NUMBER: 2004:60042 HCAPLUS  
DOCUMENT NUMBER: 140:121015  
TITLE: Three dimensional thin film devices and methods of fabrication  
INVENTOR(S): Gupta, Vikas; Johnson, A. David; Menchaca, Laticia; Martynov, Valery  
PATENT ASSIGNEE(S): Tini Alloy Co., USA  
SOURCE: U.S. Pat. Appl. Publ., 22 pp.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 20040014253	A1	20040122	US 2002-198654	20020717
US 6746890	B2	20040608		
WO 2004008504	A1	20040122	WO 2003-US21931	20030715
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
AU 2003253896	A1	20040202	AU 2003-253896	20030715
EP 1532663	A1	20050525	EP 2003-764605	20030715
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
PRIORITY APPLN. INFO.:			US 2002-198654	A 20020717
			WO 2003-US21931	W 20030715

AB Methods for making thin film multiple layered three-dimensional devices using two-dimensional MEMS techniques for use in a variety of applications including endovascular, endolumenal, intracranial, and intraocular medical applications. In the general method, a thin film first layer of the device material is deposited over a release layer which in turn is deposited on a substrate. An other release layer is deposited on the first device layer, with portions of the other release layer removed, leaving a pattern in the first device layer. In a similar manner a second layer of device material is formed in a pattern overlying the first device layer with portions of the two layers joined together leaving a portion of the release layer between them. The two release layers are removed and the first and second layers of the device material are formed into a three-dimensional shape suitable for the desired end-use application.

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 20 OF 50 USPATFULL on STN DUPLICATE 5  
ACCESSION NUMBER: 2004:105846 USPATFULL  
TITLE: Thin film shape memory alloy actuated microrelay  
INVENTOR(S): Gupta, Vikas, San Leandro, CA, UNITED STATES  
Martynov, Valery, San Francisco, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20040080239	A1	20040429
	US 7084726	B2	20060801
APPLICATION INFO.:	US 2003-661035	A1	20030915 (10)
RELATED APPLN. INFO.:	Division of Ser. No. US 2001-821840, filed on 28 Mar 2001, GRANTED, Pat. No. US 6624730		
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	APPLICATION		
LEGAL REPRESENTATIVE:	Richard E. Backus, Suite 490, 685 Market Street, San Francisco, CA, 94105		
NUMBER OF CLAIMS:	15		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	6 Drawing Page(s)		
LINE COUNT:	502		

AB A microrelay device formed on a silicon substrate wafer for use in opening and closing a current path in a circuit. A pair of electrically conducting latching beams are attached at their proximal ends to terminals on the substrate. Proximal ends of the beams have complementary shapes which releasably fit together to latch the beams and close the circuit. A pair of shape memory alloy actuators are selectively operated to change shapes which bend one of the beams in a direction which latches the distal ends, or bend the other beam to release the distal ends and open the circuit. The microrelay is bistable in its two positions, and power to the actuators is applied only for switching it open or closed,

L5 ANSWER 21 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 6

ACCESSION NUMBER:	2003:551113 HCPLUS
DOCUMENT NUMBER:	139:77990
TITLE:	Method of accurately measuring compositions of thin film shape memory alloys
INVENTOR(S):	Johnson, A. David; Martynov, Valery
PATENT ASSIGNEE(S):	USA
SOURCE:	U.S. Pat. Appl. Publ., 5 pp.
DOCUMENT TYPE:	Patent
LANGUAGE:	English
FAMILY ACC. NUM. COUNT:	1
PATENT INFORMATION:	

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 20030134440	A1	20030717	US 2002-51849	20020117
US 6620634	B2	20030916		

PRIORITY APPLN. INFO.: US 2002-51849 20020117

AB A method of measuring with high accuracy the composition of shape memory alloy elements that are sputter deposited in thin film form. An element of known composition is polished with a flat surface. An element of unknown composition is sputter deposited onto the surface. Miniature openings are made by photolithog. in the unknown layer, exposing an area of the known substrate. With adjacent areas of the two samples then only microns apart, accurate measurements of the compns. are made by comparing the x-ray spectra resulting from an electron beam scanning across the two areas.

L5 ANSWER 22 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 7

ACCESSION NUMBER:	2003:550847 HCPLUS
DOCUMENT NUMBER:	139:104653
TITLE:	Ternary alloy sputtering for fabrication of

shape-memory alloy films having high transition  
 temperature  
 INVENTOR(S): Johnson, A. David; Martynov, Valery  
 PATENT ASSIGNEE(S): Tini Alloy Co., USA  
 SOURCE: U.S. Pat. Appl. Publ., 5 pp.  
 CODEN: USXXCO  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 20030131915	A1	20030717	US 2002-51737	20020117
US 6669795	B2	20031230		

PRIORITY APPLN. INFO.: US 2002-51737 20020117  
 AB The ternary TiNi-based alloys for shape-memory films are prepared by sputtering from individual-metal targets, and have increased transition temperature for the shape-memory phase change and improved thermomech. properties. The films are sputtered from the 3 metal targets with: (a) Ti; (b) Ni; and (c) Hf, Zr, Pd, Pt, or Cu. The resulting ternary alloy contains the Ti-side metals at 50, and the Ni-side metals at 50 atomic%.

L5 ANSWER 23 OF 50 USPATFULL on STN  
 ACCESSION NUMBER: 2003:243721 USPATFULL  
 TITLE: Micro-dosing pumps and valves  
 INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES

PATENT INFORMATION:	NUMBER	KIND	DATE
US 20030170130	A1	20030911	
APPLICATION INFO.:	US 2002-121020	A1	20020410 (10)

PRIORITY INFORMATION:	NUMBER	DATE
US 2002-362972P		20020307 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	Law Offices of Richard E. Backus, The Monadnock Building, Suite 490, 685 Market Street, San Francisco, CA, 94105	
NUMBER OF CLAIMS:	6	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	3 Drawing Page(s)	
LINE COUNT:	245	
AB	A fluid micro pump or valve of a two-stage pulsatile peristaltic type. The pump body has an inlet port and an outlet port. First and second layers of SiO are formed on an Si wafers disposed in face-to-face relationship within the body. The first layers define flexible diaphragms bulge, responsive to a first fluid pressure, between a flat shape and a dome shape containing a pumping chamber. The domes overlap laterally so that fluid is pumped from one chamber to the other as the diaphragms are bulged in serial fashion. Control chambers apply fluid pressure to bulge the domes.	

L5 ANSWER 24 OF 50 USPATFULL on STN  
 ACCESSION NUMBER: 2003:185536 USPATFULL  
 TITLE: Method for sputtering TiNi shape-memory alloys  
 INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES

Martynov, Valery V., San Francisco, CA,  
UNITED STATES  
Gupta, Vikas, San Leandro, CA, UNITED STATES  
Bose, Arani, New York City, NY, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20030127318	A1	20030710
APPLICATION INFO.:	US 2003-345782	A1	20030116 (10)
RELATED APPLN. INFO.:	Division of Ser. No. US 2001-768700, filed on 24 Jan 2001, GRANTED, Pat. No. US 6533905		

	NUMBER	DATE
PRIORITY INFORMATION:	US 2000-177881P	20000124 (60)
	US 2000-211352P	20000613 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	VIDAS, ARRETT & STEINKRAUS, P.A., 6109 BLUE CIRCLE DRIVE, SUITE 2000, MINNETONKA, MN, 55343-9185	
NUMBER OF CLAIMS:	18	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	4 Drawing Page(s)	
LINE COUNT:	541	

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A thin film device, such as an intravascular stent, is disclosed. The device is formed of a seamless expanse of thin-film (i) formed of a sputtered nitinol shape memory alloy, defining, in an austenitic state, an open, interior volume, having a thickness between 0.5-50 microns, having an austenite finish temperature A<sub>sub</sub>f below 37° C.; and demonstrating a stress/strain recovery greater than 3% at 37° C. The expanse can be deformed into a substantially compacted configuration in a martensitic state, and assumes, in its austenitic state, a shape defining such open, interior volume. Also disclosed is a sputtering method for forming the device.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L5 ANSWER 25 OF 50 USPATFULL on STN  
ACCESSION NUMBER: 2003:2961 USPATFULL  
TITLE: Thin film shape memory alloy actuated flow controller  
INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES  
Gupta, Vikas, San Leandro, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20030002994	A1	20030102
APPLICATION INFO.:	US 2002-93071	A1	20020307 (10)
PRIORITY INFORMATION:	US 2001-273621P	20010307 (60)	
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	APPLICATION		
LEGAL REPRESENTATIVE:	Law Offices of Richard E. Backus, The Monadnock Building, Suite 490, 685 Market Street, San Francisco, CA, 94105		
NUMBER OF CLAIMS:	10		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	16 Drawing Page(s)		
LINE COUNT:	365		

AB A flow controller for use in microelectromechanical systems. The principal components of the controlled are a microvalve and sensor which are micromachined on one surface of a substrate that is formed with a fluid flow channel. The microvalve includes a shape memory alloy actuator element that is operated by a feedback signal from a control circuit. The sensor can be a fluid flow rate sensor or a fluid temperature sensor or a fluid pressure sensor. Conditions in the channel are sensed for generating the feedback signal.

L5 ANSWER 26 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2003:854031 HCPLUS

DOCUMENT NUMBER: 140:346560

TITLE: Heterostructures based on In-Ga-Al-N alloy system as promising media for photoelectronics and integrated optoelectronics

AUTHOR(S): Ermakov, Oleg N.; Martynov, Valery N.; Alexandrova, Galina A.; Stacharny, Sergey A.; Voytiuk, Alexander A.

CORPORATE SOURCE: "Sapfir" Joint Stock Co., Moscow, 105318, Russia

SOURCE: Proceedings of SPIE-The International Society for Optical Engineering (2003), 5126(Photoelectronics and Night Vision Devices), 232-240

CODEN: PSISDG; ISSN: 0277-786X

PUBLISHER: SPIE-The International Society for Optical Engineering

DOCUMENT TYPE: Journal; General Review

LANGUAGE: English

AB A review. With account of the integrated optoelectronics global trends including intensive search of new monocryst., polycryst. amorphous and polymer media review is presented for the present state and development trends of light emitters (light emitting diodes (LED's), laser diodes (LD's)) and photodetectors based on heterostructures in In - Ga - N alloy system. It is shown that in accordance with theor. calcn. MOCVD-grown heterostructures based on In - Ga - N alloy system can be used for the photodetectors fabrication with photocurrent gain up to 10<sup>6</sup> as well as for high-efficiency LED's with luminous intensity >1 cd and short wavelength LDs fabrication needed for optical storage system. Advantages and drawbacks of these devices are analyzed. Exptl. data are presented on the electroluminescent and photoelec. characteristics of devices based on In-Ga-Al-N system. It is supposed that statistical disorder in alloy system leads to general broadening of luminescence and photosensitive spectra as well as to the smearing of optical nonlinearities that should be observed in quantum-confined system. In its turn it is shown that statistical disorder manifestation can be related to peculiarities of MOCVD synthesis due to lattice mismatched growth and sharp nonlinear composition dependence on gaseous medium composition

REFERENCE COUNT: 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 27 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 8

ACCESSION NUMBER: 2002:315286 HCPLUS

DOCUMENT NUMBER: 136:329112

TITLE: Fabrication of free-standing film of a shape-memory alloy by sputtering deposition on a substrate precoated with sacrificial layer

INVENTOR(S): Johnson, A. David; Galhotra, Vikas; Gupta, Vikas

PATENT ASSIGNEE(S): Tini Alloy Company, USA

SOURCE: U.S. Pat. Appl. Publ., 6 pp.

CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 20020046783	A1	20020425	US 2001-902856	20010710
US 6790298	B2	20040914		

PRIORITY APPLN. INFO.: US 2000-217664P P 20000710

AB A free-standing film of shape-memory alloy is manufactured by: (a) precoating of a cleaned substrate with a sacrificial interlayer in a vacuum chamber; (b) sputter deposition of amorphous shape-memory alloy film on the sacrificial interlayer; and (c) etching away the sacrificial interlayer, leaving the free-standing alloy film nominally 1-40  $\mu\text{m}$  thick. The free-standing alloy film is annealed by heating to a crystalline state, either before or after the separation of film from the substrate. The TiNi alloy film can be deposited on Si-semiconductor wafer (or a glass slide) precoated with vapor-deposited Cr film as the sacrificial interlayer  $<1 \mu\text{m}$  thick that can be removed by etching.

REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 28 OF 50 USPATFULL on STN DUPLICATE 9

ACCESSION NUMBER: 2002:341874 USPATFULL

TITLE: Liquid microvalve

INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED STATES

PATENT ASSIGNEE(S): TiNi Alloy Company (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20020195579	A1	20021226
	US 6729599	B2	20040504
APPLICATION INFO.:	US 2002-179701	A1	20020624 (10)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2001-301222P	20010626 (60)

DOCUMENT TYPE: Utility

FILE SEGMENT: APPLICATION

LEGAL REPRESENTATIVE: Richard E. Backus, Law Offices of Richard E. Backus, 685 Market Street, Suite 490, San Francisco, CA, 94105

NUMBER OF CLAIMS: 6

EXEMPLARY CLAIM: 1

NUMBER OF DRAWINGS: 1 Drawing Page(s)

LINE COUNT: 183

AB A valve for the control of fluid flow in microsize systems, such as for transfer of small samples of blood for processing. An actuator beam comprised of a microribbon formed of a shape memory alloy is in a normally closed position where inlet and outlet ports of the valve are closed. In this position a compliant member presses against and holds the microribbon, together with a compliant tape carried below the microribbon, against the ports. The valve is actuated by heating the alloy through its crystalline phase change transition temperature. The resulting change of the microribbon to its memory shape moves the microribbon and tape away from the ports, enabling fluid flow through between the ports in a valve-open mode. The microribbon and tape are held in the valve-open mode when the alloy cools below the transition temperature by a force applied from a heat-shrinkable layer carried on the upper side of the microribbon.

L5 ANSWER 29 OF 50 USPATFULL on STN

DUPLICATE 10

ACCESSION NUMBER: 2002:305959 USPATFULL  
TITLE: Miniature latching valve  
INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED  
STATES  
Benson, Glendon, Danville, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20020171055	A1	20021121
	US 6742761	B2	20040601
APPLICATION INFO.:	US 2002-121017	A1	20020410 (10)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2001-282644P	20010410 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	Law Offices of Richard E. Backus, The Monadnock Building, Suite 490, 685 Market Street, San Francisco, CA, 94105	
NUMBER OF CLAIMS:	9	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	5 Drawing Page(s)	
LINE COUNT:	319	

AB An SMA actuated miniature latching valve for on and off control of fluid flow. A valve closure includes a poppet for opening and closing the fluid flow path. The poppet is operated responsive to an actuator mechanism which has SMA wires arranged to be actuated by electric resistant heating. Actuation causes different ones of the wires to contract and pull the poppet either toward or away from a valve seat. A latching mechanism comprising a conical spring operates between two bistable positions which hold the poppet either fully open or fully closed without further application of power to the actuators. A method of forming a secure mechanical and electrical connection between an SMA wire end and its support includes the steps of swaging a metal cone between a cone-shaped hole in the support and the wire end.

L5 ANSWER 30 OF 50 USPATFULL on STN DUPLICATE 11  
ACCESSION NUMBER: 2002:140190 USPATFULL  
TITLE: Shutter for fiber optic systems  
INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED  
STATES  
Hice, David, Morgan Hill, CA, UNITED STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20020071167	A1	20020613
	US 6614570	B2	20030902
APPLICATION INFO.:	US 2001-968740	A1	20010929 (9)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2000-236956P	20000929 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	Law Offices of Richard E. Backus, The Monadnock Building, Suite 490, 685 Market Street, San Francisco, CA, 94105	
NUMBER OF CLAIMS:	4	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	2 Drawing Page(s)	

LINE COUNT: 202

AB A light shutter for controlling a light signal between occluded and uninterrupted states. The shutter has a frame which mounts a beam under compression so that it assumes either of two bi-stable buckled positions. An occluder is mounted on the beam, A shape memory alloy actuator is provided which applies a force transverse on the beam as the actuator is heated to its shape change transition temperature. The transverse force bends the beam, causing it to buckle to the opposite bi-stable position. This moves the occluder into or out of the path of the light signal.

L5 ANSWER 31 OF 50 USPATFULL on STN DUPLICATE 12  
ACCESSION NUMBER: 2002:111418 USPATFULL  
TITLE: Thin film shape memory alloy actuated microrelay  
INVENTOR(S): Johnson, A. David, San Leandro, CA, UNITED  
STATES  
Galhotra, Vikas, Union City, CA, UNITED STATES  
Gupta, Vikas, San Leandro, CA, UNITED STATES  
Martynov, Valery, San Francisco, CA, UNITED  
STATES

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20020057148	A1	20020516
	US 6624730	B2	20030923
APPLICATION INFO.:	US 2001-821840	A1	20010328 (9)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2000-192766P	20000328 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	Law Offices of Richard, The Monadnock Building, Suite 490, 685 Market Street, San Francisco, CA, 94105	
NUMBER OF CLAIMS:	15	
EXEMPLARY CLAIM:	1	
NUMBER OF DRAWINGS:	6 Drawing Page(s)	
LINE COUNT:	501	

AB A microrelay device formed on a silicon substrate wafer for use in opening and closing a current path in a circuit. A pair of electrically conducting latching beams are attached at their proximal ends to terminals on the substrate. Proximal ends of the beams have complementary shapes which releasably fit together to latch the beams and close the circuit. A pair of shape memory alloy actuators are selectively operated to change shapes which bend one of the beams in a direction which latches the distal ends, or bend the other beam to release the distal ends and open the circuit. The microrelay is bistable in its two positions, and power to the actuators is applied only for switching it open or closed,

L5 ANSWER 32 OF 50 USPATFULL on STN  
ACCESSION NUMBER: 2002:276824 USPATFULL  
TITLE: Optical switching device and method  
INVENTOR(S): Johnson, A. David, San Leandro, CA, United  
States  
PATENT ASSIGNEE(S): TiNi Alloy Company, San Leandro, CA, United States  
(U.S. corporation)

	NUMBER	KIND	DATE

PATENT INFORMATION: US 6470108 B1 20021022  
APPLICATION INFO.: US 2000-558893 20000426 (9)  
DOCUMENT TYPE: Utility  
FILE SEGMENT: GRANTED  
PRIMARY EXAMINER: Ullah, Akm E.  
ASSISTANT EXAMINER: Rahll, Jerry T  
LEGAL REPRESENTATIVE: Backus, Richard E.  
NUMBER OF CLAIMS: 20  
EXEMPLARY CLAIM: 1  
NUMBER OF DRAWINGS: 11 Drawing Figure(s); 5 Drawing Page(s)  
LINE COUNT: 535

AB A method of measuring with high accuracy the composition of shape memory alloy elements that are sputter deposited in thin film form. An element of known composition is polished with a flat surface. An element of unknown composition is sputter deposited onto the surface. Miniature openings are made by photography in the unknown layer, exposing an area of the known substrate. With adjacent areas of the two samples then only microns apart, accurate measurements of the compositions are made by comparing the X-ray spectra resulting from an electron beam scanning across the two areas.

L5 ANSWER 33 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2002:363185 HCPLUS  
DOCUMENT NUMBER: 137:50332  
TITLE: Sputter-deposited shape-memory alloy thin films:  
Properties and applications  
AUTHOR(S): Ishida, Akira; Martynov, Valery  
CORPORATE SOURCE: Japan  
SOURCE: MRS Bulletin (2002), 27(2), 111-114  
CODEN: MRSBEA; ISSN: 0883-7694  
PUBLISHER: Materials Research Society  
DOCUMENT TYPE: Journal; General Review  
LANGUAGE: English

AB A review. Shape-memory alloy (SMA) thin films formed by sputter deposition have attracted considerable attention in the last decade. Current intensive research demonstrates that unique fine microstructures are responsible for the superior shape-memory characteristics observed in thin films as compared with bulk materials. Simultaneously, much effort has been undertaken to develop and fabricate micro devices actuated by SMA thin films. This article reviews the research to date on shape-memory behavior and the mech. properties of SMA thin films in connection with their peculiar microstructures. Promising applications such as microvalves are demonstrated, along with a focused discussion on process-related problems. All of the results indicate that thin-film shape-memory actuators are ready to contribute to the development of microelectromech. systems.

REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 34 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 13  
ACCESSION NUMBER: 2001:545922 HCPLUS  
DOCUMENT NUMBER: 135:112059  
TITLE: Formation of thin-film shape memory alloys for space-filling intravascular stents  
INVENTOR(S): Johnson, A. David; Martynov, Valery  
V.; Gupta, Vikas; Bose, Arani  
PATENT ASSIGNEE(S): Smart Therapeutics, Inc., USA  
SOURCE: PCT Int. Appl., 23 pp.  
CODEN: PIXXD2  
DOCUMENT TYPE: Patent  
LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001053559	A1	20010726	WO 2001-US2253	20010124
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG				
US 20010039449	A1	20011108	US 2001-768700	20010124
US 6533905	B2	20030318		
US 20030127318	A1	20030710	US 2003-345782	20030116
US 20050159808	A1	20050721	US 2004-27814	20041228
PRIORITY APPLN. INFO.:			US 2000-177881P	P 20000124
			US 2000-211352P	P 20000613
			US 2001-768700	A3 20010124
			US 2003-345782	B1 20030116

AB A thin film shape memory alloy device, such as an intravascular stent, is disclosed. The device is formed of a seamless expanse of thin-film (i) formed of a sputtered nitinol shape memory alloy, defining, in an austenitic state, an open, interior volume, having a thickness between 0.5-50  $\mu$ m, having an austenite finish temperature Af below 37°; and demonstrating a stress/strain recovery >3 at 37°. The expanse can be deformed into a substantially compacted configuration in a martensitic state, and assumes, in its austenitic state, a shape defining such open, interior volume. Also disclosed is a sputtering method for forming the device.

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 35 OF 50 USPATFULL on STN DUPLICATE 14  
ACCESSION NUMBER: 2001:200341 USPATFULL  
TITLE: Thin-film shape memory alloy device and method  
INVENTOR(S): Johnson, A. David, San Leandro, CA, United States  
Martynov, Valery V., San Francisco, CA, United States  
Gupta, Vikas, San Leandro, CA, United States  
Bose, Arani, New York City, NY, United States

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 20010039449	A1	20011108
	US 6533905	B2	20030318
APPLICATION INFO.:	US 2001-768700	A1	20010124 (9)

	NUMBER	DATE
PRIORITY INFORMATION:	US 2000-177881P	20000124 (60)
	US 2000-211352P	20000613 (60)
DOCUMENT TYPE:	Utility	
FILE SEGMENT:	APPLICATION	
LEGAL REPRESENTATIVE:	IOTA PI LAW GROUP, 350 CAMBRIDGE AVENUE SUITE 250, P O BOX 60850, PALO ALTO, CA, 94306-0850	
NUMBER OF CLAIMS:	18	
EXEMPLARY CLAIM:	1	

NUMBER OF DRAWINGS: 4 Drawing Page(s)

LINE COUNT: 541

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

AB A thin film device, such as an intravascular stent, is disclosed. The device is formed of a seamless expanse of thin-film (i) formed of a sputtered nitinol shape memory alloy, defining, in an austenitic state, an open, interior volume, having a thickness between 0.5-50 microns, having an austenite finish temperature A<sub>sub</sub>f below 37° C.; and demonstrating a stress/strain recovery greater than 3% at 37° C. The expanse can be deformed into a substantially compacted configuration in a martensitic state, and assumes, in its austenitic state, a shape defining such open, interior volume. Also disclosed is a sputtering method for forming the device.

CAS INDEXING IS AVAILABLE FOR THIS PATENT.

L5 ANSWER 36 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2002:202055 HCPLUS

DOCUMENT NUMBER: 136:297950

TITLE: Applications of shape memory alloys: advantages, disadvantages, and limitations

AUTHOR(S): Johnson, A. David; Martynov, Valery  
; Gupta, Vikas

CORPORATE SOURCE: TiNi Alloy Company, USA

SOURCE: Proceedings of SPIE-The International Society for Optical Engineering (2001), 4557(Micromachining and Microfabrication Process Technology VII), 341-351

CODEN: PSISDG; ISSN: 0277-786X

PUBLISHER: SPIE-The International Society for Optical Engineering

DOCUMENT TYPE: Journal; General Review

LANGUAGE: English

AB A review. Titanium-nickel (TiNi) based shape memory alloys (SMAs) are used in a wide range of applications. They are especially practical as thin film actuators because of the large work output per unit of actuator mass and ability for rapid thermal cycling due to large surface to volume ratio. Sputter deposited thin TiNi film has been developed for use in miniature actuators for microvalves, microrelays, optical switches and also for building small implantable medical devices. Chemical composition of the deposited

SMA must be held within close limits and for the film to have shape memory properties a crystallization anneal is required. To avoid flaws in film quality

the surface on which SMA is deposited has to meet certain criteria. Basic MEMS processes (photolithog. and chemical etching) are used for device fabrication. Although TiNi is resistant to most chems., some acids used in MEMS can damage it. Thus, selection of processes and reagents compatible with TiNi requires care and experimentation. This paper discusses some applications of SMA thin films along with experience gained in bringing device s to production readiness. It illustrates simple design rules for incorporating shape memory microactuators in MEMS devices and describes some of the pitfalls to be avoided.

REFERENCE COUNT: 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 37 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2001:415792 HCPLUS

DOCUMENT NUMBER: 135:187430

TITLE: Material aspects of OEIC development based on A2B6 compounds on silicone and sapphire

AUTHOR(S): Ermakov, Oleg N.; Martynov, Valery N.;  
Ashomko, Alexey E.

CORPORATE SOURCE: "Saphir" Joint Stock Company, Moscow Region, 105318,

SOURCE: Russia  
Proceedings of SPIE-The International Society for Optical Engineering (2000), 4340(Photoelectronics and Night Vision Devices), 254-260  
CODEN: PSISDG; ISSN: 0277-786X

PUBLISHER: SPIE-The International Society for Optical Engineering  
DOCUMENT TYPE: Journal  
LANGUAGE: English

AB General trends and different technol. approaches to modern optoelectronic integrated circuits (OEICs) development and fabrication are considered. It is emphasized that from point of view multifunctional OEICs realization direct gap semiconductor materials both A3B5 and A2B6 are primarily desirable. Data are presented for optical, luminescent and photoelec. properties of several A2B6 compds., including CdS, CdSe, CdSSe, CdTe. Material aspects are discussed imposing technol. limitations for A2B6 compds. use in OEICs development and fabrication.

REFERENCE COUNT: 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L5 ANSWER 38 OF 50 USPATFULL on STN  
ACCESSION NUMBER: 1999:119718 USPATFULL  
TITLE: Fluid flow control valve  
INVENTOR(S): Johnson, A. David, San Leandro, CA, United States  
PATENT ASSIGNEE(S): TiNi Alloy Company, San Leandro, CA, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5960812		19991005
APPLICATION INFO.:	US 1997-900885		19970725 (8)
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	Granted		
PRIMARY EXAMINER:	Rivell, John		
LEGAL REPRESENTATIVE:	Flehr Hohbach Test Albritton & Herbert LLP		
NUMBER OF CLAIMS:	11		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	5 Drawing Figure(s); 3 Drawing Page(s)		
LINE COUNT:	370		

AB A valve and method of operation for controlling the flow of fluid from a pressurized fluid source while maintaining a secure seal against fluid leakage over long periods of time. The valve includes a valve body formed with an inlet channel which extends through a strain concentrating portion. The strain concentrating portion has an ultimate strength less than that of support portions of the body. An actuator applies a load to the valve body sufficient to create a stress which exceeds the ultimate strength of the strain concentrating portion. The strain concentrating portion then fractures into parts separated by a gap. The fracture forms openings from the inlet channel into the gap to create a flow path from the fluid source into an outlet channel.

L5 ANSWER 39 OF 50 USPATFULL on STN  
ACCESSION NUMBER: 1999:56771 USPATFULL  
TITLE: Fabrication system, method and apparatus for microelectromechanical devices  
INVENTOR(S): Johnson, A. David, San Leandro, CA, United States  
Busta, Heinz H., Plainsboro, NJ, United States  
Nowicki, Ronald S., Sunnyvale, CA, United States  
PATENT ASSIGNEE(S): TiNi Alloy Company, San Leandro, CA, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5903099		19990511
APPLICATION INFO.:	US 1997-862649		19970523 (8)
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	Granted		
PRIMARY EXAMINER:	Ramsey, Kenneth J.		
LEGAL REPRESENTATIVE:	Flehr Hohbach Test Albritton & Herbert LLP		
NUMBER OF CLAIMS:	20		
EXEMPLARY CLAIM:	1,3		
NUMBER OF DRAWINGS:	9 Drawing Figure(s); 4 Drawing Page(s)		
LINE COUNT:	500		

AB A fabrication system and method of fabrication for producing microelectromechanical devices such as field-effect displays using thin-film technology. A spacer is carried at its proximal end on the surface of a substrate having field-effect emitters with the spacer being enabled for tilting movement from a nested position to a deployed position which is orthogonal to the plane of the substrate. An actuator is formed with one end connected with the substrate and another end connected with spacer. The actuator is made of a shape memory alloy material which contracts when heated through the material's phase-change transition temperature. Contraction of the actuator exerts a pulling force on the spacer which is tilted to the deployed position. A plurality of the spacers are distributed over the area of the display. A glass plate having a phosphor-coated surface is fitted over the distal ends of the deployed spacer.

L5 ANSWER 40 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN DUPLICATE 15

ACCESSION NUMBER: 2005:775855 HCPLUS  
 TITLE: Fabrication system, method and apparatus for microelectromechanical devices  
 INVENTOR(S): Johnson, A. David; Busta, Heinz H.; Nowicki, Ronald S.  
 PATENT ASSIGNEE(S): Tini Alloy Company, USA  
 SOURCE: PCT Int. Appl., No pp. given  
 CODEN: PIXXD2  
 DOCUMENT TYPE: Patent  
 LANGUAGE: English  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9853362	A2	19981126	WO 1998-US10352	19980521
W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW				
RW: GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG				
PRIORITY APPLN. INFO.:			US 1997-862649	A 19970523
AB Unavailable				

L5 ANSWER 41 OF 50 USPATFULL on STN

ACCESSION NUMBER: 1998:73943 USPATFULL  
 TITLE: Release device for retaining pin  
 INVENTOR(S): Bokaie, Michael D., Fremont, CA, United States

PATENT ASSIGNEE(S): Busch, John D., San Jose, CA, United States  
 Johnson, A. David, San Leandro, CA, United States  
 Petty, Bruce, Dunsmuir, CA, United States  
 TiNi Alloy Company, San Leandro, CA, United States  
 (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5771742		19980630
APPLICATION INFO.:	US 1995-526715		19950911 (8)
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	Granted		
PRIMARY EXAMINER:	Bonck, Rodney H.		
ASSISTANT EXAMINER:	Grabow, Troy		
LEGAL REPRESENTATIVE:	Flehr Hohbach Test Albritton & Herbert LLP		
NUMBER OF CLAIMS:	10		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	8 Drawing Figure(s); 6 Drawing Page(s)		
LINE COUNT:	823		

AB A release mechanism employing an actuating element of a shape memory alloy material. When the actuating element is heated through its phase-change transition temperature it applies a force which moves a latch to a position which activates the higher energy stored in a drive spring for moving a retaining element out of engagement with a structure. A detent when in a captured position releasably holds the retaining element in its locked position, and the detent is moved from a captured position to a retracted position to release the retaining element when the latch is moved by the actuating element.

L5 ANSWER 42 OF 50 USPATFULL on STN  
 ACCESSION NUMBER: 97:29830 USPATFULL  
 TITLE: Shape memory alloy microactuator having an electrostatic force and heating means  
 INVENTOR(S): Johnson, A. David, San Leandro, CA, United States  
 Block, Barry, Los Altos, CA, United States  
 Mauger, Philip, Santa Clara, CA, United States  
 PATENT ASSIGNEE(S): MJB Company, San Leandro, CA, United States (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5619177		19970408
APPLICATION INFO.:	US 1995-381681		19950127 (8)
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	Granted		
PRIMARY EXAMINER:	Picard, Leo P.		
ASSISTANT EXAMINER:	Gandhi, Jayprakash N.		
LEGAL REPRESENTATIVE:	Flehr, Hohbach, Test, Albritton & Herbert		
NUMBER OF CLAIMS:	21		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	8 Drawing Figure(s); 4 Drawing Page(s)		
LINE COUNT:	707		

AB A microactuator and method of operation is disclosed for use in actuating valves, electrical contacts, light beams, sensors and other elements between different actuation modes. An actuator member comprised of a shape memory alloy layer is mounted on an elastic substrate, and the proximal end of the actuator member is carried by a base. The shape memory alloy material is heated through its phase change transition temperature so that it deforms by changing volume to bend the distal end

of the actuator member in a first direction relative to the base. Stress forces in the substrate oppose the bending movement, and when the shape change layer is cooled below the transition temperature the stress forces move the distal in a second direction which returns the shape change layer to its low temperature shape. Electrostatic forces are selectively applied between the actuator member and base for clamping the actuator member in one of its positions. In another embodiment a bistable actuator is provided in which the actuator member can be operated between two stable positions.

L5 ANSWER 43 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1996:68085 HCPLUS  
DOCUMENT NUMBER: 124:132183  
ORIGINAL REFERENCE NO.: 124:24311a, 24314a  
TITLE: Recent progress in thin film shape memory microactuators  
AUTHOR(S): Johnson, A. David; Shahonian, Erik J.  
CORPORATE SOURCE: TiNi Alloy Company, San Leandro, CA, 94577, USA  
SOURCE: Proceedings - IEEE Micro Electro Mechanical Systems, 8th, Amsterdam, Jan. 29-Feb. 2, 1995 (1995), 216-20.  
Institute of Electrical and Electronics Engineers: New York, N. Y.  
CODEN: 62GIA8  
DOCUMENT TYPE: Conference; General Review  
LANGUAGE: English  
AB A review with several refs. on heat-actuated shape-memory alloy thin-film microscale devices which operate at low voltages.

L5 ANSWER 44 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1995:709252 HCPLUS  
DOCUMENT NUMBER: 123:150305  
ORIGINAL REFERENCE NO.: 123:26633a, 26636a  
TITLE: High-transition-temperature shape-memory alloy film  
AUTHOR(S): Johnson, A. David; Martynov, Valery V.; Shahonian, Eric J.  
CORPORATE SOURCE: Shape Memory Alloys Application, TiNi Alloy Company, San Leandro, CA, 94577, USA  
SOURCE: Proceedings of SPIE-The International Society for Optical Engineering (1995), 2441(Smart Materials), 165-70  
CODEN: PSISDG; ISSN: 0277-786X  
PUBLISHER: SPIE-The International Society for Optical Engineering  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Using conventional magnetron sputtering deposition processes three different types of shape memory alloys (FeNi based, CuAl based and TiNi based) were examined as potential candidates for the production of high temperature SMA thin film. CuAlNi and TiNiHf SMA were successfully deposited on silicon wafers and thin films of 4-20  $\mu\text{m}$  were produced. After annealing at .apprx.500  $^{\circ}\text{C}$  both CuAlNi and TiNiHf films exhibited reversible high temperature martensitic transition. For CuAlNi thin films, annealing itself was found to be inadequate for obtaining transformation intervals corresponding to that of the target. To deal with the problem it is expected that addnl. quenching after solid solution heat treatment will be necessary. Of the three alloys examined, the most promising candidate for high temperature thin film microactuators is TiNiHf. It was found that by changing the Hf content in the target, the transformation start temperature of thin films can be easily adjusted in a temperature range from 100  $^{\circ}\text{C}$  to 200  $^{\circ}\text{C}$ .

L5 ANSWER 45 OF 50 USPATFULL on STN  
 ACCESSION NUMBER: 94:56928 USPATFULL  
 TITLE: Shape memory alloy film actuated microvalve  
 INVENTOR(S): Johnson, A. David, San Leandro, CA, United States  
 PATENT ASSIGNEE(S): Ray, Curtis A., Alamo, CA, United States  
 TiNi Alloy Company, San Leandro, CA, United States  
 (U.S. corporation)

	NUMBER	KIND	DATE
PATENT INFORMATION:	US 5325880		19940705
APPLICATION INFO.:	US 1993-49572		19930419 (8)
DOCUMENT TYPE:	Utility		
FILE SEGMENT:	Granted		
PRIMARY EXAMINER:	Chambers, A. Michael		
LEGAL REPRESENTATIVE:	Flehr, Hohbach, Test, Albritton & Herbert		
NUMBER OF CLAIMS:	27		
EXEMPLARY CLAIM:	1		
NUMBER OF DRAWINGS:	12 Drawing Figure(s); 5 Drawing Page(s)		
LINE COUNT:	814		

AB A sub-miniature valve which provides an actuator of shape memory alloy film coupled so as to move a poppet adjacent to a valve port. The shape memory alloy film actuator is thermally cycled through its phase change transition temperature, resulting in either a contraction or elongation of the actuator. This causes the poppet to move relative to the port and either increase or decrease fluid flow. The shape memory alloy film is biased toward its deformed position when cooled below its transition temperature. The valve can be electrically operated with commonly available voltages, including those used for micro-electronics. The relatively large forces and displacements achieved using the shape memory alloy film provide less restriction and greater flow than in other similarly sized valves.

L5 ANSWER 46 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN  
 ACCESSION NUMBER: 1992:596333 HCPLUS  
 DOCUMENT NUMBER: 117:196333  
 ORIGINAL REFERENCE NO.: 117:33837a, 33840a  
 TITLE: Oriented nickel-titanium shape memory alloy films prepared by annealing during deposition  
 AUTHOR(S): Gisser, Kathleen R. C.; Busch, John D.; Johnson, A. David; Ellis, Arthur B.  
 CORPORATE SOURCE: Dep. Chem., Univ. Wisconsin, Madison, WI, 53706, USA  
 SOURCE: Applied Physics Letters (1992), 61(14), 1632-4  
 CODEN: APPLAB; ISSN: 0003-6951  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English

AB Nickel-titanium shape memory alloy films, between 2 and 10  $\mu\text{m}$  thick, were sputter deposited onto (100) silicon substrates. Films deposited onto a substrate at ambient temperature were amorphous; however, several post-deposition annealing procedures produced crystalline films exhibiting the B2-to-B19' phase transition that gives rise to the shape memory effect. Films that were deposited onto a heated substrate, 350-460°, crystallized during deposition, eliminating the need for a sep. annealing step. Powder x-ray diffraction indicated that these films were highly oriented, with the NiTi (110)B2 face parallel to the silicon substrate (100) face.

L5 ANSWER 47 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN  
 ACCESSION NUMBER: 1993:592701 HCPLUS  
 DOCUMENT NUMBER: 119:192701  
 ORIGINAL REFERENCE NO.: 119:34172h, 34173a

TITLE: A silicon-based shape memory alloy microvalve  
AUTHOR(S): Ray, Curtis A.; Sloan, Charles L.; Johnson, A.  
David; Busch, John D.; Petty, Bruce R.  
CORPORATE SOURCE: Microflow Anal., Inc., Livermore, CA, USA  
SOURCE: Materials Research Society Symposium Proceedings  
(1992), 276 (Smart Materials Fabrication and Materials  
for Micro-Electro-Mechanical Systems), 161-6  
CODEN: MRSPDH; ISSN: 0272-9172  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB A new actuator for Si microvalves was developed and tested. A thin film  
shape memory alloy provides for large deflections with high speed, low  
power, and small size. The actuator is batch fabricated with planar  
processes.

L5 ANSWER 48 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1993:592700 HCPLUS  
DOCUMENT NUMBER: 119:192700  
ORIGINAL REFERENCE NO.: 119:34169a, 34172a  
TITLE: Fabrication of silicon-based shape memory alloy  
micro-actuators  
AUTHOR(S): Johnson, A. David; Busch, J. D.; Ray, Curtis  
A.; Sloan, Charles  
CORPORATE SOURCE: TiNi Alloy Co., San Leandro, CA, 94550, USA  
SOURCE: Materials Research Society Symposium Proceedings  
(1992), 276 (Smart Materials Fabrication and Materials  
for Micro-Electro-Mechanical Systems), 151-60  
CODEN: MRSPDH; ISSN: 0272-9172  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Thin film memory alloy was integrated with Si in a new actuation mechanism  
for micro-electro-mech. systems. Ni-Ti film was compared with other  
actuators. Recent results of chemical milling processes developed to  
fabricate shape memory alloy micro-actuators in Si, and simple actuation  
mechanisms which were fabricated and tested are described.

L5 ANSWER 49 OF 50 HCPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1992:596237 HCPLUS  
DOCUMENT NUMBER: 117:196237  
ORIGINAL REFERENCE NO.: 117:33821a, 33824a  
TITLE: Vacuum-deposited titanium-nickel (TiNi) shape memory  
film: characterization and applications in  
microdevices  
AUTHOR(S): Johnson, A. David  
CORPORATE SOURCE: TiNi Alloy Co., Oakland, CA, 94608, USA  
SOURCE: Journal of Micromechanics and Microengineering (1991),  
1(1), 34-41  
CODEN: JMMIEZ; ISSN: 0960-1317  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Thin-film NiTi shape-memory alloy was vacuum sputter deposited,  
characterized by crystallog. and elec. and mech. tests, and incorporated  
as an actuator in miniature devices. Composition and heat treatment of the  
film are critical as contamination by O and other species affects the  
transition temperature. A variety of substrates was used, and adhesion was  
satisfactory. Shape-memory behavior comparable to that of bulk TiNi was  
observed in free-standing films. The work output/unit volume TiNi is greater  
than achieved with electrostatic or piezoactuators. Actuators in the  
few-micrometer size domain are feasible and have desirable characteristics  
for elec. and optical activation. Anticipated applications include  
miniature valves, bistable optical memory elements, and microactuators for  
Si microelectromech. devices.

L5 ANSWER 50 OF 50 GBFULL COPYRIGHT 2009 Univentio on STN

ACCESSION NUMBER: 1102117 GBFULL ED 20081130  
UP 20081130

TITLE: A device for cleaning surface of flat rolled stock  
INVENTOR(S): MARTYNOV VALERY DMITRIEVICH; IGNATENKO  
NIKOLAI NIKOLAEVICH; MONAKHOV VLADIMIR NIKOLAEVICH;  
CHERNYA NIKOLAI NIKOLAEVICH; LUBYANOV ALEXANDR  
VASILIEVICH; BUCHKA LIDIA ALEXANDROVNA; IVANOV EVGENY  
VASILIEVICH; JURIN VLADISLAV FEDEROVICH; VASILIEV PAVEL  
NIKOLAEVICH

PATENT APPLICANT(S): INST SELSKOKHOZYAISTVENNOGO MA

LANGUAGE OF PUBL.: English

DOCUMENT TYPE: Patent

PATENT INFO TYPE: GBA PATENT SPECIFICATION (UNDER 2,000,000) OR  
PUBLISHED PATENT APPLICATION (FROM 2,000,000)

PATENT INFO:

	NUMBER	KIND	DATE
APPLICATION INFO.:	GB 1102117	A	19680207
PRIORITY INFO.:	GB 1966-14153	A	19660330
	GB 1966-14153	A	19660330 *

GBA GBFULL ED 20081130

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FILE COVERS 1907 - 26 Mar 2009 VOL 150 ISS 13  
FILE LAST UPDATED: 25 Mar 2009 (20090325/ED)

Caplus now includes complete International Patent Classification (IPC) reclassification data for the third quarter of 2008.

CAS Information Use Policies apply and are available at:

<http://www.cas.org/legal/infopolicy.html>

This file contains CAS Registry Numbers for easy and accurate substance identification.

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=> s Single crystal shape memory alloy devices and methods
  1494909 SINGLE
    3583 SINGLES
  1497941 SINGLE
    (SINGLE OR SINGLES)
  1456582 CRYSTAL
    715493 CRYSTALS
  1769605 CRYSTAL
    (CRYSTAL OR CRYSTALS)
  405891 SHAPE
    77619 SHAPES
  462486 SHAPE
    (SHAPE OR SHAPES)
  179550 MEMORY
    7471 MEMORIES
  181682 MEMORY
    (MEMORY OR MEMORIES)
  746953 ALLOY
  559957 ALLOYS
  933293 ALLOY
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  745401 DEVICES
    15 DEVICESES
  745406 DEVICES
    (DEVICES OR DEVICESES)
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  1576534 METHODS
    (METHODS OR METHODSES)
L6      0 SINGLE CRYSTAL SHAPE MEMORY ALLOY DEVICES AND METHODS

=> s (single crystal) and (shape memory)
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  1497941 SINGLE
    (SINGLE OR SINGLES)
  1456582 CRYSTAL
    715493 CRYSTALS
  1769605 CRYSTAL
    (CRYSTAL OR CRYSTALS)
  281821 SINGLE CRYSTAL
    (SINGLE(W)CRYSTAL)
  405891 SHAPE
    77619 SHAPES
  462486 SHAPE
    (SHAPE OR SHAPES)
  179550 MEMORY
    7471 MEMORIES
  181682 MEMORY
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  16962 SHAPE MEMORY
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L7      892 (SINGLE CRYSTAL) AND (SHAPE MEMORY)

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280 JOHNSON DAVID/AU  
42 JOHNSON DAVID/IN  
L9 280 JOHNSON DAVID/AU, IN

=> s 19 and single crystal  
1494909 SINGLE  
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1497941 SINGLE  
(SINGLE OR SINGLES)  
1456582 CRYSTAL  
715493 CRYSTALS  
1769605 CRYSTAL  
(CRYSTAL OR CRYSTALS)  
281821 SINGLE CRYSTAL  
(SINGLE(W)CRYSTAL)  
L10 1 L9 AND SINGLE CRYSTAL

=> d 110

L10 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2009 ACS on STN  
AN 2007:62629 CAPLUS  
DN 146:259946  
TI Ultralow thermal conductivity in disordered, layered WSe<sub>2</sub> crystals  
AU Chiritescu, Catalin; Cahill, David G.; Nguyen, Ngoc; Johnson,  
David; Bodapati, Arun; Kebinski, Pawel; Zschack, Paul  
CS Department of Materials Science and Engineering, Frederick Seitz Materials  
Research Laboratory, University of Illinois, Urbana, IL, 61801, USA  
SO Science (Washington, DC, United States) (2007), 315(5810), 351-353  
CODEN: SCIEAS; ISSN: 0036-8075  
PB American Association for the Advancement of Science  
DT Journal  
LA English  
RE.CNT 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

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YOU HAVE REQUESTED DATA FROM FILE 'HCAPLUS, USPATFULL, EPFULL, GBFULL' - CONTINUE?  
(Y)/N:y

L5 ANSWER 9 OF 50 USPATFULL on STN  
AN 2007:158201 USPATFULL  
TI Single crystal shape memory alloy devices and methods  
IN Johnson, A. David, San Leandro, CA, UNITED STATES  
Bokaie, Michael, San Leandro, CA, UNITED STATES  
Martynov, Valery, San Francisco, CA, UNITED STATES  
PA ATINI ALLOY COMPANY, SAN LEANDRO, CALIFORNIA, CANADA, 94577 (U.S.  
corporation)  
PI US 20070137740 A1 20070621  
AI US 2005-588413 A1 20050504 (10)  
WO 2005-US15703 20050504  
20060731 PCT 371 date  
PRAI US 2005-11041185 20050124  
US 2004-569659P 20040506 (60)  
DT Utility  
FS APPLICATION

LREP Richard E Backus, 887 28th Avenue, San Francisco, CA, 94121, US  
CLMN Number of Claims: 49  
ECL Exemplary Claim: 1  
DRWN 10 Drawing Page(s)  
AB Devices and methods of making devices having one or more components made of single crystal shape memory alloy capable of large recoverable distortions, defined herein as "hyperelastic" SMA. Recoverable Strains are as large as 9 percent, and in special circumstances as large as 22 percent. Hyperelastic SMAs exhibit no creep or gradual change during repeated cycling because there are no crystal boundaries. Hyperelastic properties are inherent in the single crystal as formed: no cold work or special heat treatment is necessary. Alloy components are Cu--Al--X where X may be Ni, Fe, Co, Mn. Single crystals are pulled from melt as in the Stepanov method and quenched by rapid cooling to prevent selective precipitation of individual elemental components. Conventional methods of finishing are used: milling, turning, electro-discharge machining, abrasion. Fields of application include aerospace, military, automotive, medical devices, microelectronics, and consumer products.

PARN CROSS-REFERENCE TO PRIOR APPLICATION

This application claims the benefit under 35 USC .sctn.119(e) of U.S. provisional application Ser. No. 60/569,659 filed May 6, 2004, and also claims the benefit under 35 USC .sctn.120 of non-provisional application Ser. No. 11/041,185 filed Jan. 24, 2005.

SUMM BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to mechanical devices that have a component in which large recoverable distortions are advantageous.

2. Description of the Related Art

Shape memory alloy materials (also termed SMA) are well known. One Common SMA material is TiNi (also known as nitinol), which is an alloy of nearly equal atomic content of the elements Ti and Ni. Such an SMA material will undergo a crystalline phase transformation from martensite to austenite when heated through the material's phase change temperature. When below that temperature the material can be plastically deformed from a "memory shape" responsive to stress. When heated through the transformation temperature, it reverts to the memory shape while exerting considerable force.

In the prior art many different useful devices employing SMA have been developed and commercialized. The typical SMAs used in the prior art devices are of polycrystalline form. Polycrystalline SMA exhibits both: 1) shape memory recovery (when cycled through the material's transformation temperature) and 2) superelasticity. The term superelasticity applies to an SMA material which, when above the transformation temperature (in the austenite crystalline phase), exhibits a strain recovery of several percent. This is in comparison to a strain recovery on the order of only about 0.5 percent for non-SMA

Superelasticity results from stress-induced conversion from austenite to martensite as stress is increased beyond a critical level, and reversion from martensite to austenite as stress is reduced below a second (lower) critical level. These phenomena produce a pair of plateaus of constant stress in the plot of stress versus strain at a particular temperature. Single crystal superelasticity is characterized by an abrupt change in slope of the stress strain plot at a combination

of stress, strain, and temperature characteristic of that particular alloy.

Shape memory copper-aluminum based alloys grown as single crystals have been experimentally made in laboratories, typically in combination with about 5 percent Ni, Fe, Co, or Mn. The most common such CuAl-based alloy is CuAlNi, which is used throughout this description as the primary example: others are CuAlFe, CuAlCo, and CuAlMn. Single crystal SMA materials when stressed have the property of enabling a shape memory strain recovery much greater than polycrystalline SMA, and superelastic shape recovery as great as 24 percent.

DRWD BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A and 1B is a graph show the stress-strain curves for the typical superelastic properties of a polycrystalline SMA compared with the hyperelastic properties of single crystal SMA in accordance with the invention.

FIGS. 2A, 2B. and 2C are perspective views of a snap-through hinge in accordance with another embodiment of the invention showing the hinge in different operating configurations.

FIG. 3 is a perspective view of an extendible boom in accordance with another embodiment incorporating the hinges of FIGS. 2A, 2B and 2C and in its stowed mode.

FIG. 4 is a perspective view of the extendible boom of FIG. 3 shown in its deployed mode.

FIG. 5 is a perspective view of a guidewire in accordance with another embodiment.

FIG. 6 is a perspective view of a group of probe tips in accordance with another embodiment.

FIG. 7 is a side view taken along the line 7-7 of FIG. 6.

FIG. 8 is an axial section view of a spring in accordance with another embodiment.

FIG. 9 is a load-deflection chart for the spring of FIG. 8.

FIGS. 10A and 10B are perspective views of a device useful as a probe or pin in accordance with another embodiment showing different operating positions.

FIGS. 11A and 11B are perspective views of a spring actuator in accordance with another embodiment showing different operating positions.

FIG. 12A is a perspective view of a heat pipe and deployable in accordance with another embodiment shown in one operating position.

FIG. 12B is a perspective view of the heat pipe and deployable of FIG. 12A shown in another operating position.

FIG. 13A is a perspective view of a switch flexure in accordance with another embodiment shown in one operating position.

FIG. 13B is a perspective view of the flexure of FIG. 13A shown in

FIGS. 14A and 14B are perspective views of a leaf spring in accordance with another embodiment shown in different operating positions.

FIG. 15A is an axial section view of an actuator in accordance with another embodiment shown in one operating position.

FIG. 15B is an axial section view of the actuator of FIG. 15A shown in another operating position.

FIG. 16A, 16B and 16C are perspective views of a collapsible tube in accordance with another embodiment shown in different operating positions.

FIG. 17A is a perspective view of a hinge for a deployable in accordance with another embodiment shown in one set of operating positions.

FIG. 17B is a perspective view of the hinge and deployable of FIG. 17A shown in another set of operating positions.

#### DETD OBJECTS AND SUMMARY OF THE INVENTION

A general object of this invention is to provide new and improved devices and apparatus having a component or components in which large recoverable distortions can be advantageous.

The invention in summary provides devices and apparatus having at least one component made of a single crystal shape memory alloy, defined herein as hyperelastic SMA, having properties enabling the component to undergo large recoverable distortions. Such distortions can be at least an order of magnitude greater than that which could be obtained if the component were made of non-SMA metals and alloys, and nearly an order of magnitude greater than can be obtained with polycrystalline SMA materials. In different embodiments of the invention, devices and apparatus having components comprised of hyperelastic SMA can serve as: actuators for the active deployment of structures such as booms, antennae and solar panels; actuators for releasing door locks, moving mirrors and fuel injectors; flexures; constant force springs; connectors; dampeners; valves; microchip substrates; support members; non-explosive separation devices; catheter guide wires; laproscopic instruments; medical implants such as stents; micro-connectors; switches; circuit breakers; electronic test equipment; flexible electric cables; heat conductors; consumer products such as safety valves, eyeglass frames and cellular telephone antennae; and many other devices, and apparatus in which large recoverable distortions of a component or components can be advantageous.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

In its broadest concept, the present invention provides devices and apparatus having a component made of a single crystal SMA material which has the property of enabling a repeatable strain recovery of as much as 24 percent.

Because the range of strain recovery is so far beyond the maximum strain recovery of both conventional polycrystalline SMA materials and non-SMA metals and alloys, such repeatable strain recovery property of single crystal SMA is referred to herein as hyperelastic. Further, materials exhibiting hyperelastic properties are referred to herein as hyperelastic materials. Also as used herein, the phrase large recoverable distortion means the magnitude of repeatable strain recovery

described above for a hyperelastic material.

Within the past two decades, SMA materials have become popular for use as actuators due to their ability to generate substantial stress during shape recovery of large strains during temperature-induced phase transformation. The energy density of such actuators is high compared to other alternatives, such as electromagnetic, electrostatic, bimetals, piezoelectric, and linear and volume thermal expansion effects of ordinary materials. The operating cycle of an SMA actuator includes deformation during or after cooling, and subsequent heating which results in a temperature-induced phase transformation and recovery of the deformation. SMA actuation is favored where relatively large force and small displacements are required in a device that is small in size and low in mass.

Shape memory is the ability of certain alloys to recover plastic deformation, which is based on a diffusionless solid-solid lattice distortive structural phase transformation. The performance of shape memory alloy based actuators strongly depends on the amount of recoverable deformation. In turn, recoverable deformation itself is a function of the lattice distortions which take place during martensitic phase transformation in the particular SMA. For an individual grain (single crystal) of SMA, the amount of possible recoverable strain after uniaxial loading, depends on the particular crystallographic orientation of the deformation tensor relative to the crystallographic axes of the high temperature (austenite) phase and the sign of applied load (tension or compression). For a given deformation mode, the recoverable strain is strongly orientation dependent, and for the various crystallographic directions it differs by approximately a factor of two.

The recoverable deformation of these polycrystalline SMA alloys, due to the lattice distortion during diffusionless solid-solid phase transition, is substantially lower than is theoretically possible for a given material. The main reason for this is that for a conglomerate of randomly oriented grains (as is normally the case for polycrystalline materials), the average deformation will always be less than the maximum available value for a given grain. The diffusionless nature of phase transitions in SMA results in strict lattice correspondence between the high temperature (austenite) and low temperature (martensite) lattices. As the symmetry of the martensite lattice is lower than that of austenite, maximum deformation in each grain can only be attained in one particular crystallographic direction. This means that for randomly oriented grains (as normally is the case for polycrystalline materials), the average deformation will be at least a factor of two less than the maximum.

The restrictions imposed on a polycrystalline body by the deformation mechanism is another reason for diminished recoverable deformation in polycrystals as compared with a single crystal. To maintain integrity of the polycrystal, deformation of each particular grain has to be less than that corresponding to the theoretical limit for lattice distortion.

Therefore, for polycrystalline material, resultant recovery is the vector sum of particular grain deformations over the whole range of grain orientations, and is significantly smaller than the maximum value for an individual single crystalline grain.

By comparison, recoverable deformation close to the theoretical value (lattice distortion) can be achieved in single crystalline SMA. In addition to the substantially increased recoverable deformation, absence of grain boundaries results in increased strength and longer fatigue life. Specifically, as a single crystal, the strength of the grain for

CuAlNi SMA can be as high as 800 MPa with the potential limit for recoverable deformation up to 9 percent and even higher for special deformation modes. An additional advantage of a single crystal SMA is that not only the thermally induced phase transformation may contribute to the recoverable deformation, as in the case for polycrystals, but also the stress-induced martensite-to-martensite phase transitions. Depending on the material, this additional contribution may be up to 15 percent therefore the total theoretical recovery can be as high as 24 percent.

The graphs of FIGS. 1A and 1B show the stress-strain curves for a CuAlNi single crystal SMA of the invention as well for a prior art polycrystal TiNi SMA. Solid line curve 20 shows the single crystal SMA in its austenitic phase while curve 22 shows the martensitic phase. Solid line curve 24 shows the polycrystal SMA in its austenitic phase while curve 26 shows the martensitic phase. The graphs show the comparisons between the two SMAs as explained in the following.

The advantages of single crystal SMA over polycrystal SMA for mechanical devices include:

1. Greater than 9 percent strain recovery. In FIG. 1A the region 28 of curve 22 for the austenitic phase of the single hyperelastic SMA shows the magnitude of its strain recovery in comparison to the comparable region 30 of curve 26 for an austenitic polycrystal SMA. There is a three-fold gain in performance over the conventional SMA materials made from bulk materials, such as TiNi. Depending on how the sample is used, the greater than 9 percent recovery can either be used in the high temperature state (when in austenite phase) as a hyperelastic spring, for example, or deformed 9 percent (when in martensite phase) and then heated to recovery as an actuator.
2. True constant force deflection. Unlike polycrystalline materials which reach their strain/stress plateau strength in a gradual fashion and maintain an upward slope when deformed further, hyperelastic SMA materials have a very sharp and clear plateau strain/stress that provides a truly flat spring rate when deformed up to 9 percent. This is shown in FIG. 1B by the region 32 of curve 20. The stress level at which the plateau occurs depends on the temperature difference between the transformation temperature and the loading temperature.

Additionally, single crystal SMAs exhibiting hyperelasticity benefit from a second stress plateau which can increase the total recoverable strain to 22 percent.

3. Very narrow loading-unloading hysteresis. As a result there is substantially the same constant force spring rate during both loading (increasing stress) and unloading (decreasing stress). This is shown in FIG. 1B by the narrow vertical spacing 34 between the upper portion of curve 20 which represents loading and the lower portion representing unloading. This characteristic is key in applications where the flexure undergoes repeated cycling. In comparison, there is a relatively wide spacing between the corresponding loading and unloading portions of curve 24.
4. Recovery which is 100 percent repeatable and complete. One of the drawbacks of polycrystalline SMA materials has always been the "settling" that occurs as the material is cycled back and forth. This is shown in FIG. 1B for curve 24 by the spacing 36 of the curve end representing the beginning of the loading and the curve end representing the end of the unloading. The settling problem has required that the material be either "trained" as part of the manufacturing process, or designed into the application such that the permanent deformation which occurs over the first several cycles does not adversely affect the function of the

device. By comparison, hyperelastic SMA materials do not develop such permanent deformations and therefore significantly simplify the design process into various applications. This is shown in FIG. 1B where the beginning of curve 20 representing unloading coincides with the end of the curve representing loading.

5. Very low yield strength when martensitic. This property is shown by the horizontal portion 38 of curve 22, which is relatively much lower than the corresponding portion of curve 26. The property is key for designing an SMA actuator which is two way (i.e., it cycles back and forth between two states). This is typically done by incorporating a biasing element, which overcomes the SMA when cold or martensitic, and establishes position one until the SMA is heated and overcomes the biasing element for driving the mechanism to position two. The problem with this type of device when using polycrystalline SMA is that the biasing element robs a significant amount of work output from the SMA. By comparison, an equivalent hyperelastic SMA element has a much lower yield strength when martensitic, enabling a much softer biasing element, and therefore generating a much greater net work output.

6. Ultra-low transition temperature. Hyperelastic SMA materials made from CuAlNi can be manufactured with transition temperatures close to absolute zero (-270 Celsius). This compares to SMA materials made from TiNi which have a practical transition temperature limit of -100 Celsius. The advantage from hyperelastic SMA is its use in various cryogenic applications such as those aboard spacecraft which require cooling of certain instruments and sensors to very cold temperatures. In this case a hyperelastic SMA actuator can be used as a valve to control flow of the cooling medium.
7. Intrinsic hyperelastic property. TiNi SMA can be conditioned, through a combination of alloying, heat treatment and cold working, to have superelastic properties. Single crystal CuAlNi SMA has intrinsic hyperelastic properties: a crystal of CuAlNi is hyperelastic immediately after being formed (pulled and quenched) with no further processing required.

Method of Fabricating Single Crystal SMA

Since single crystals cannot be processed by conventional hot or cold mechanical formation without breaking single crystallinity, a special procedure is required for shaping single crystals in the process of growth as the crystal is pulled from melt, resulting in finished shape.

Single crystal SMA is made in a special crystal-pulling apparatus. A seed of the desired alloy is lowered into a crucible containing a melted ingot of the alloy composition, and gradually drawn up. Surface tension pulls the melted metal along with the seed. The rising column cools as it leaves the surface of the melt. The rate of drawing is controlled to correspond with the rate of cooling so that a solid crystal is formed at a region that becomes a crystallization front. This front remains stationary while the crystal, liquid below and solid above, travels through it. The top surface of the melt can contain a die (of the desired cross-sectional shape) that forms the shape of the crystal as it grows. This procedure generally is known as the Stepanov method of making single crystals.

From the known Cu-Al phase diagram, rapid cooling (quenching) of the drawn crystal is necessary for production of single crystal beta phase that has the desired hyperelastic properties. Starting with beta phase at 850-1000 Celsius, if the alloy is cooled slowly the beta phase precipitates as beta+gamma, and at lower temperatures, as alpha+gamma-2. Single crystal beta phase, which requires that Al remains in solution at room temperature, is formed by rapid cooling in salt water from 850 Celsius. At elevated temperatures, above 300 Celsius, some decomposition

gradually occurs; in fact, beta phase is not entirely stable at room temperatures but the time constant for decay is many years. The known phase diagram for the ternary CuAlNi alloy has similar characteristics.

#### General Description of Device Applications Embodying the Invention

The various device applications contemplated by the invention with hyperelastic single crystal SMA are constrained by the intrinsic properties of the material, and by its behavior during forming and machining and other secondary manufacturing processes. For example, it has been shown that exposure to high temperature and/or stress can lead to recrystallization and the formation of unwanted crystals. The known forming and machining processes which are successful include lathe machining, electro-discharge machining (EDM), grinding, laser cutting, electro-polishing, and the like. These processes can be used to manufacture many basic shapes of the hyperelastic SMA, including rods, ribbons, flexures, coil springs, leaf springs, serrated tubes, tubes, pins and bi-stable elements.

Single crystal shape memory materials have significantly smaller thermal and mechanical hysteresis than polycrystalline materials. This is advantageous since less energy is absorbed in the material on each cycle, less heating occurs and more of the energy is recovered during the shape recovery.

Single crystal SMA hyperelastic components of mechanical devices generally provide a significant advantage over other device components currently available because they enable large displacement at constant force. For example, aerospace applications include actuators, which may be used as motors to gently deploy spacecraft components such as booms, antennae and solar panels. Other aerospace applications include usage as constant force springs, flexures or connectors that need to accommodate very severe deformation but which spring back once the constraint is removed.

Commercial applications for hyperelastic SMA components are similarly of wide scope. They may be employed as a significantly improved replacement actuator or flexure over prior art SMA actuator applications. These applications include thermostatic valves, tools and instruments used in medicine, and other applications such as eyeglass frames and cellular telephone antennae.

The invention contemplates the following device applications having hyperelastic SMA components:

- Aerospace and Military: As an actuator for active deployment of a host of devices including booms, antennae and solar panels.
- As a flexure or constant force spring used for passive movement of cover doors or hinges.
- As a connector where it is necessary to accommodate significant motion of adjacent parts. For example, heat pipes aboard spacecraft require such connectors to carry heating/cooling capability across a hinge to a deployable.
- As a damper used to absorb or mitigate energy coming from nearby pyrotechnic release devices.
- As a valve for a broad range of temperatures including cryogenic. Such valves have applications aboard missiles and satellites that carry sophisticated instruments such as sensors or cameras that need to be cryogenically cooled.
- As an actuator in arming and safing ordnance.
- As a substrate or support member for a surface or component which needs to accommodate large motion including applications on optical assemblies

which require support and actuation (movement).

As a non-explosive separation device of smaller size than such bolts that are prior art.

As a flexible heat conductor or heat sink.

Medical:

For making catheter guidewires that are significantly more flexible than those currently made from stainless steel or polycrystal SMA. The CuAlNi alloy has no detectable cytotoxicity effect on the human body, and thus is compatible for use in a non-implantable function such as a catheter.

In laproscopic instruments where it is necessary to make tools which can tolerate large distortions.

In implants such as stents where the material can be made bio compatible by coating with Au.

Automotive: As an actuator for releasing door locks, moving mirrors and for driving fuel injector valves.

Computers

In micro-connectors and switches where large displacement capability allows for more reliable assembly, and for the fabrication of smaller parts.

Flexible cables for print-heads and the like.

Commercial:

As rings made for use as metallic connectors to secure braid in cabling applications.

Use in switches, relays, circuit breakers and electronic test equipment.

Consumer Products For use in safety valves, eye glass frames and automobile and cellular telephone antennae. Embodiments Providing Equipment with Hyperelastic Components

The present embodiment provides the use of hyperelastic SMA in applications such as equipment for sports and other activities.

CuAlNi single crystal material stores an enormous amount of mechanical energy when it is deformed, and then releases the energy when the deforming force is removed. Unlike normally elastic material however the energy is stored and released at nearly constant force. These characteristics make this material desirable for use in equipment for use in a variety of sports and other activities including:

Bicycle wheel spokes equipped with a hyperelastic part to eliminate transmission to the hands of shocks due to small bumps in the road.

Running shoes and basketball shoes can contain a hyperelastic cushion that will reduce fatigue and enable the player to jump higher.

Skis that have a degree of hyperelastic behavior can reduce the shock of bumpy or irregular snow conditions and thereby improve control and provide a more comfortable, stable platform.

A warfighter may wear a form of 'exoskeleton' that enables a human to jump higher or survive descending from a higher distance than normal. The capacity for storage of mechanical energy is as much as 3 Joules gram of CuAlNi, and the majority of the energy is stored or released at a constant force resulting in constant acceleration. A parachutist, for example, wearing special boots containing a few hundred grams of CuAlNi would be protected from injury resulting from hitting the ground at a higher than usual speed.

Many of the above benefits will be most advantageous to amateurs, occasional athletes, and elderly people whose flexibility is impaired.

#### Snap-Through Hinge/Flexure Embodiments

The following embodiments provide devices such as hinges or flexures made of hyperelastic SMA that allow constrained relative motion without

sliding or rotating components. These are used in space vehicles to provide lightweight structures such as booms that must be folded for launch into space. Similar flexures can also be used to replace prior art eyewear hinges.

These embodiments incorporate single-crystal hyperelastic materials into devices resembling tape-hinges resulting in superior load-carrying capability.

For spacecraft applications, the hinges/flexures must bend through an arc of 180 degrees to be useful in folding structures such as booms that are stored during launch in a minimal volume. Minimum size of the folded structure is achieved when the flexures bend through a minimal radius. In prior art implementations, flexures were made of thin steel curved tape. Steel in thin tape form does not provide optimum rigidity and strength for a functioning boom. This invention uses hyperelastic SMA in flexures capable of repeated recoverable large deformations to minimize size, maximize strength, and provide good vibration damping characteristics.

Among the design considerations for flexure design are that compression rigidity and resistance to buckling of the flexures should be consistent with that of the other components of the structure. These considerations set specifications for the flexure: length, thickness, width, curvature. This leads in turn to a design for a sliding die-mold for making the hyperelastic components.

In this embodiment, a tape hinge or flexure is formed by making a portion of a thin-walled cylinder and fixing it to rigid members or struts at the ends.

A principal feature of the invention is a "snap-through" action that resists bending because of its cylindrical symmetry which is very rigid for its mass, but when an applied force causes the flexure to buckle, it bends through a large angle with a smaller force. After buckling there is little restoring force because of its shape, that is, bending through a severe bending angle at a small radius of bend is possible because of the hyperelastic quality of the flexure. The flexure returns to its straight cylindrical rigid shape with a snap action because rigidity increases rapidly as the flexure assumes its cylindrical shell shape.

Performance of these devices, and their applicability, can be enhanced by increasing the recoverable strain, enlarging the stress tolerance, and extending the hyperelastic temperature range of the SMA materials. The method of deformation in tape-hinges results in non-uniform strain.

As the bending torque/moment is applied, the edge of the tape element is under tension, resulting in strain. After buckling occurs, this strain remains, and a bending moment is applied such that the inner surface is under compression and the outer surface is under tensile stress, with a neutral axis near the center of the cross-section.

Incorporating the SMA hyperelastic technology into a design in which all mechanical elements are in pure tension or pure compression, it becomes possible to build a structure that is very light, has a high packing factor for stowage, has a minimum of moving parts, and is very rigid for its weight. It is also possible to make it highly damped against vibrations. Hyperelastic alloys allow construction of structures that are strong against buckling while attaining a sharp radius of bend for compact folding.

It is desirable to make hinges that have no rotating or sliding parts.

These devices can be used in spacecraft. One known form of hinge is a carpenters tape hinge. Such a hinge may be made by bending an elongate element having a thickness much smaller than the width and having a curved cross-section. Such an element has a 'snap-action'. These hinges when made of steel or materials with ordinary elasticity are restricted to a small thickness in order to control the degree of strain within the elastic limit of the material. Limiting the strain to elastic deformation limits the rigidity that can be achieved with BeCu and steel tape-spring hinges. Thus such prior art hinges are limited to relatively light loads, and Structures incorporating such hinges are not as rigid as is desired.

A material having greatly increased elasticity will enable the fabrication of 'carpenter's tape' hinges with increased load-carrying capacity. One such material is hyperelastic single-crystal copper aluminum nickel in accordance with the present invention. This embodiment provides a significant improvement in the performance of tape hinges by exploiting the properties of hyperelastic shape memory phase change material.

A material having greatly increased elasticity will enable the fabrication of 'carpenter's tape' hinges with increased load-carrying capacity.

FIGS. 2A, 2B and 2C illustrate different operational positions of a snap-through hinge or flexure 40 in accordance with one embodiment of the invention shown in FIG. 3. The flexure is comprised of a hollow tube of hyperelastic SMA. Between first and second flexure ends 44 and 46, the tube on one side is partially cut away to provide a weakened portion 42 that is in the shape of a circular segment in cross section.

As shown in FIG. 3, weakened portion 42 causes the flexure to undergo a snap-action or buckling action when its two ends are pivoted to a certain relative position (such as shown in FIG. 2B) between the stowed position with the shape of FIG. 2A and the deployed position with the shape of FIG. 2C. The FIG. 2B position is at the buckling point. The pivoting is initiated by a certain applied force until the buckling point is reached. Then mechanical energy stored in the flexure is released to continue the bending until the fully deployed position is reached. The full range of movement between the two positions is through an angle of 180 degrees or more.

Flexure 40 is adapted for use in coupling together components of the extendible boom segment 48 of FIGS. 3 and 4. Boom segment 48 has applications for use in spacecraft, such as for deploying payloads, positioning solar panels and the like. The boom segment comprises a pair of rigid frames 50, 52, each of which is comprised of four rigid side struts 54, 56 connected together at their ends to form a rectangular or square frame configuration. The four respective corners of the two frames are interconnected by four sets of paired longitudinal rigid struts 58, 60. When in the stowed position of FIG. 3 the longitudinal struts lay in planes that are parallel to the planes in which the frames lie. When in the deployed position of FIG. 4 each pair of longitudinal struts are coaxial and extend orthogonal with the planes of the frames. In the deployed position brace wires 62, 62 can be fitted diagonally between opposite corners of the squares or rectangles formed between the two frames.

A plurality (shown as eight for the two frames) of flexures 40a, couple together the outer ends of each pair of struts to respective corners of the two frames. One end of each such flexure is secured to the frame corner while the other end of that flexure is secured to the respective

end of a strut. A plurality (shown as four for the two frames) of flexures 40d, couple together the inner ends of the strut pairs.

The flexures are operated toward their deployed positions by suitable actuators, not shown. For deployment, the actuators could be operated to move the two frames 50, 52 axially apart a distance sufficient to pivotally move the opposite ends of each flexure through arcs that cause the flexure to buckle and snap-through to the full 180 degrees arc of travel, which then becomes a stable position. A plurality of the boom segments could be mounted together in stacked relationship to form a boom structure that can deploy out to a longer overall length, as desired.

The snap-through hinge or flexure 40 offers additional stiffness when in the deployed position. In the prior art, hinge/flexure devices have been manufactured from materials such as Stainless Steel or Beryllium Copper. However, such devices aboard space applications have been limited to smaller deployables primarily because they lack the stiffness necessary to support larger structures. This is due to the very limited strain (<0.3 percent elastic) which these materials can endure. Therefore to achieve the necessary 180 degree fold for compact stowage, they must be made ultra thin reducing their axial stiffness. By comparison, the much greater strain recovery capability of hyperelastic SMA components allows flexures as in the present invention to be made on the order of 30 times thicker, providing an order of magnitude increase in axial rigidity.

Combining novel boom architecture with hyperelastic SMA enables implementation of ultralight, compact structures such as booms for use in space deployment of solar sails, large-aperture antennas, and optical instruments. These booms will have the advantages of light weight, minimal moving parts, and reduced stored mechanical energy compared to other folding structure designs.

Advantages and disadvantages of the hyperelastic tape hinge flexure/boom device embodiments of the invention include:

There are fewer moving parts. The flexure has only one part: it deploys by unfolding without sliding or rotating parts.

The boom can be scaled from a few cm to many meters in length. It has a potentially high packing factor; a large boom can be stowed in a small volume. Its deployed length to stowed length ratio may be 50 to one or higher.

Light weight. Since all elements are in pure tension or pure compression, it will be possible to optimize the elements for a particular design to minimize weight.

The boom contains no sliding or rotating parts. There is less opportunity for stiction to present a problem as may happen with age in a mechanism such as a hinge with a pin.

Each boom segment is readily re-stowable on the ground to permit testing. The segment could be made. remotely re-stowable. Hyperelastic Guidewire Embodiments

Guidewires are used to enable insertion of catheters into blood vessels and many other medical procedures. A guidewire is inserted ahead of the tip of the catheter, and then the catheter is advanced thought the blood vessel guided by the wire. The principal characteristics of guidewires are flexibility to permit following the contour of tortuous lumens, and resistance to kinking.

The best prior art guidewires in current use are superelastic wires made of polycrystalline SMA, principally TiNi. The superelastic property

of TiNi limits the forces exerted by the wire against the blood vessel tissue while the wire bends as it follows curvatures of the lumen. TiNi superelastic guidewires are less susceptible to kinking than stainless steel wires, and they have good "torque-ability", that is they can be turned (twisted) along their long axis without objectionable flexing.

Single-crystal wires of CuAlNi SMA exhibit hyperelasticity compared to prior art shape memory wires, and the shape recovery is total rather than partial, as shown in FIG. 1. These properties are exploited to produce guidewires that can access blood vessels that are so tortuous as to be inaccessible or nearly inaccessible to prior art guidewires.

#### Method of Forming Hyperelastic SMA Wires

Rods of CuAlNi are formed by pulling them from a melted ingot by the Stepanov method. The composition of the ingot from which the wire is drawn can be adjusted, thereby lowering its transformation temperature, and making the wire stiffer. The composition of the ingot is made such that at human body temperature of 37 Celsius, the CuAlNi material is hyperelastic.

The rod is subsequently re-heated and quenched by rapid cooling to retain the nickel and aluminum dissolved in the copper matrix. The rod is heated in an air furnace and dropped into a salt-water bath. Salt water is used for the quenching bath because fewer bubbles are formed and the resulting temperature drop is more rapid.

CuAlNi single crystal material cannot be plastically deformed to reduced diameter, so after quenching the rod is centerless ground and otherwise processed by abrasive machining to achieve the desired size and shape. The rod may be processed by conventional machining so long as the surface stresses are not so great as to cause multiple large crystals to form at the surface. Micro- or nano-crystals may be removed by abrasion and polishing, including electro-polishing.

The rod may also be processed by EDM. After EDM, the surface should be abraded to remove the re-deposited material and micro- or nano-crystals that may have formed. Otherwise these may act as a source for crack initiation. Single crystal CuAlNi is notch and crack sensitive, making it appear brittle if the surface is not smooth.

Wires of single crystal CuAlNi SMA can be deformed more than TiNi wires and still recover all of the deformation without damage when the restraining force is removed. Increased flexibility enables a CuAlNi wire to bend through a smaller radius without becoming permanently deformed. Hence CuAlNi SMA guidewires are superior to those made of polycrystalline SMAs such as Nitinol.

In hyperelastic SMA wires stiffness is not isotropic. For example, a wire can be elongated in the <100> direction much more easily and to a larger strain than in the <110> direction. This is used to advantage for making guidewires that are very flexible but have good 'torque-ability'.

Stiffness can be tuned from wire to wire. Two wires of the same diameter may be designed to have different stiffness through minor adjustments in the composition.

Stiffness can also be tuned along the length of a wire by two methods. First, differing composition can be accomplished, as an ingot of a given composition can be used as a seed for pulling a second ingot as a continuous single crystal of slightly different composition having increased or diminished stiffness. Second, the fraction of aluminum that

remains in solution depends on the temperature to which the material is heated before quenching. In that case, a heater is provided to heat one end of the wire to a slightly higher temperature than the other so that when the wire is quenched by rapid submersion in salt water the cooler end has less dissolved aluminum and nickel.

#### Description of a Guidewire Embodiment

FIG. 5 illustrates an embodiment of the invention, which comprises a hyperelastic guidewire 64 of single crystal SMA. The guidewire is shown with its distal end protruding from the forward end of a catheter 66, although the invention contemplates use of a hyperelastic guidewire in other procedures within the human body.

The guidewire is formed with a thickness in the range 0.012 to 0.039 inches, and preferably 0.018 and 0.038 inches. The guidewire can have different lengths depending on the application. The preferred length is in the range of 42 and 100 inches.

The hyperelastic SMA guidewire can be fabricated with a non-elastic segment, such as the tip. This is accomplished by making the segment of single crystal SMA having a transition temperature above body temperature of 37° C. The material in this segment is then martensitic, is easily deformed, and remains deformed after being deformed. Deformation can be removed by heating to above the transformation temperature while the object is at zero external stress so that the wire can be inserted into a lumen. At the desired position within the lumen, the segment is then heated by suitable means above the transition temperature so that the tip reverts to its memory shape with the specific curve or turn and in which the tip segment remains non-elastic as long as it is above the transition temperature.

CuAlNi can also be combined with other materials to make composite materials with specific properties. CuAlNi single crystal can be pulled from melt as a cylinder or tube. Adding lubricants can increase tube lubricity. The single crystal CuAlNi wires can be coated with polymers or with metals. Such coatings can be used for providing increased biocompatibility.

#### Single Crystal SMA Guidewire Advantages

The advantages of the guidewires of the invention include their suitability for use in minimally invasive surgery, especially intravascular procedures. The guidewires have increased flexibility compared with conventional materials used in such procedures. The guidewires enable surgeons of ordinary skill to perform certain specific procedures that currently require highly skilled specialists. The guidewires of these embodiments can save time in the operating room. The guidewires have the ability to be more versatile than ordinary prior art guidewires, in particular enabling the surgeon to use the same guidewire both for entering a tortuous lumen and for deployment of a balloon or other appliance.

#### Probe Tip Embodiments

Microelectronics circuits, fabricated on silicon dies, are becoming smaller, more complex, and faster. Each of these characteristics raises problems with manufacture.

The microelectronics industry faces two principal problems: extreme miniaturization and high data transfer rates, which manifests itself as High frequencies. The time may be approaching when microelectronics

circuits on chips can be manufactured but cannot be adequately tested during manufacture.

Smaller chips mean that spacing between contact pads becomes smaller. Typical pitch of bonding pads ('bumps') is now smaller than 0.5 mm. Recommended contact force is in the tens of grams.

Increasing complexity brings with it a need for increased testing during manufacture. Wafers, dies, and die modules are tested before installation of a component in a system. This increased testing is expensive: up to 60 percent of manufacturing cost. And increased handling can lead to damage of the die unless the contacts are carefully probed. Each test runs some risk of damage to the die, so that methods that minimize damage are desirable to optimize yield.

Microprocessors now operate at multiple gigahertz rates. At such high frequencies, radiation from exposed conductors as short as a few millimeters is significant, leading to cross talk between connectors and loss of signal strength. A method of shielding leads, analogous to coaxial cable, would ameliorate this source of testing failure.

A solution to these problems is constrained by requirements of manufacturing:

Every new tool should be backwards compatible so that new equipment can be integrated with existing equipment and methods.

Methods should not damage pads.

Contact should have 'wipe' to remove oxide and make low-ohmic contact.

Contact force should be adequate for low-ohmic contact: tens of grams.

Compliance is needed to compensate for tolerances in pad height and misalignment of dies in fixturing.

Variation in height of 'bumps' is of the order of 0.0001 to 0.001 inches. 2.5 to 25 micrometers)

A method of contact that is reversible (that is, a temporary contact in the sense that it can be un-made) would solve many problems. Soldered contacts are not easily reversed, and damage is likely. Differential thermal expansion of silicon dies and ball grid arrays means that re-flowed solder is deformed repeatedly throughout the lifetime as the chip is heated and cooled. Solder hardens and crystallizes with time, and becomes brittle. When it fractures, malfunctions (especially intermittent problems) occur.

The present embodiment provides means of establishing temporary low-resistance electrical connections with greatly increased compliance and uniform contacting force. For this purpose an alloy with high electrical conductivity and hyperelasticity is used: single crystal copper-aluminum-nickel SMA. Such an alloy constitutes an enabling technology for surmounting the problems of electrical connectors in microelectronics manufacture and testing.

Single crystal CuAlNi may be deformed (strained) more than 9 percent, and recovery is complete. After a linear elastic region, the typical stress-strain isothermal curve for hyperelastic CuAlNi is a plateau. Recovery produces a second plateau. Hysteresis is minimal. Fatigue lifetime is many millions. of cycles. Component materials are inexpensive, and low cost may be achieved in mass manufacture.

Electrical resistivity is low.

Among the advantages that electrical contacts made from hyperelastic CuAlNi provide over existing tungsten and molybdenum needles are:

Hyperelastic contacts that produce the same force regardless of displacement means that the total force for a specific number of contacts is constant and predictable.

Good electrical conductance (low resistivity) means less loss of power and less generation of heat.

Enablement of systems for reversible electrical contact directly to the bare die or bumps on the bare die. Such a system would enable multi-chip modules to be reversibly assembled, and if one chip in a module fails, it may be replaced rather than discard the entire module or attempt to un-solder it for repair.

The potential to provide small, low-ohmic, reversible, minimally-damaging, constant-force electrical contactors for die testing and for assembly of die modules.

Electrical contactors made of single-crystal CuAlNi are capable of large strain; their mode of deformation is hyperelastic; repeated large strains are completely recovered with no fatigue. Method of Fabricating Single-Crystal CuAlNi Probe Tips.

Single crystal rods of CuAlNi are pulled from melted ingot by the Stepanov method, then heated and quenched to lock in the dissolved aluminum.

From the phase diagram for Cu-Al it may be seen that quenching is necessary to retain dissolved Al. When the alloy is cooled slowly the beta phase precipitates as beta+gamma, and at lower temperatures, as alpha+gamma-2. Beta phase has desirable hyperelastic qualities. A similar phase diagram applies to the ternary CuAlNi system.

Individual needles of CuAlNi are cut from rods and formed to shape by conventional methods of machining, including electrical discharge machining and sawing (dicing). After machining operations the individual components are smoothed to remove surface micro-cracks and nano-crystals that are formed on the surface by heat and/or stress. Smoothing may be done by abrasives or by electropolishing.

#### Description of Probe Tip Embodiment

FIGS. 6 and 7 illustrate certain of the steps in fabricating a plurality of probe tips 70, 72 in accordance with the invention. A round single crystal boule 5 mm-10 mm diameter is pulled from CuAlNi melt. The boule is heated to 900 Celsius and quenched in salt water. A thin rectangular parallelepiped slice 74 (0.01 to 0.1 mm thick, 2 to 10 mm wide, and 8 to 15 mm long) is cut from the boule by the EDM process. At the same time, a plurality (shown as six) of spaced-apart slots 76, 78 are cut at one end of the slice to define seven cantilevers, 70, 72 between the slots. The slice is cut to have the shape of FIG. 6 along the <100> direction of the crystal. As the slots are formed a wedge shaped feature or point 77 is formed on the end of each cantilever to define a row of sharp points. The slots are cut very narrow parallel to the <100> direction.

The cantilevers are typically 3 mm long and spaced apart a distance of 0.1 to 0.5 mm. Narrow slots, not shown, are formed as extensions from slots 76, 78 to mechanically separate and electrically isolate the individual cantilevers.

The assembly comprising the cantilevers on slice 74 is then affixed to

a PC board, not shown, carrying traces that make electrical contacts with the cantilevers.

#### Large Displacement Spring Embodiment

The present embodiment comprises a spring, shown at 80 in FIG. 8, of the well-known Belleville washer configuration and which is comprised of a hyperelastic CuAlNi SMA material.

Belleville washers are used in applications that require storage of a large amount of energy in a small volume. Materials used for Belleville washers include steel, beryllium copper, and stainless steel.

FIG. 9 illustrates the force-displacement curve for a Belleville spring made of hardened stainless steel. This type of spring is very stiff unless it is extremely thin, and the stroke is necessarily small or the steel becomes overstrained. Use of hyperelastic SMA enables a much larger stroke.

The present embodiment of a Belleville washer configuration formed of hyperelastic CuAlNi SMA provides for springs with extremely different characteristics from those made of ordinary materials. The shape of the force-displacement curve for materials with ordinary elasticity is dictated by the Young's modulus E which, for normally elastic elements, is constant. In the case of hyperelastic materials, E is constant up to the 'knee' of the stress-strain curve, beyond which point the force is nearly constant as the stress-strain curve becomes a plateau: Young's modulus E becomes a dependent variable. In the case of a Belleville spring the stress varies along a radius, so the point at which E changes depends on position. This non-linear behavior of a hyperelastic alloy makes calculation or simulation of behavior by calculation difficult and unproductive. Instead, devices are fabricated and force versus distance characteristics are measured in trial and error fashion.

#### Bistable Element Embodiments

Bistable elements such as buckling beams and Belleville washers made from Hyperelastic SMA have improved characteristics compared to bistable elements fabricated from ordinary materials such as steel and beryllium copper. In particular, the sidewise displacement of a buckling beam of specific dimensions can be an order of magnitude larger than that of a beam of material with ordinary elasticity, and the force needed to change the state of a bistable buckling beam is much less. This permits their use in miniature switches and valves.

A buckling element uses material in pure compressive stress or in bending which is a combination of compression and tension. Hyperelastic CuAlNi has different characteristics in compression than in tension. This enables designs that are not feasible with normal materials. Because the modulus for compression is higher than the modulus for tensile stress the neutral axis does not correspond to the geometrical center of a bending beam.

#### Embodiments Providing Probes and Pins

FIGS. 10A and 10B show an embodiment comprising a device 82 for use as a probe, such as for medical use in the human body, or as a pin for releasably securing things together, or as a needle. Device 82 is comprised of a proximal end 84, which can be a handle or catheter, and a distal end 86 formed with a pointed tip 88. The distal end is formed of a hyperelastic CuAlNi SMA. FIG. 10A shows the distal end in its low temperature martensite state, while FIG. 10B shows the distal end in its

high temperature austenite state, which is its memory shape in the illustrated embodiment the memory shape is in the form of a hook. The use of hyperelastic CuAlNi SMA in place of other materials such as superelastic TiNi SMA provides advantages comprising allowing for more severe bending of the distal end, and greater resistance to breakage or other failures.

#### Embodiment Providing Spring Actuator

FIGS. 11A and 11B show an embodiment comprising a compression coil spring 85, which can be used as an actuator. Spring 85 is formed of a hyperelastic SMA. FIG. 11A shows the spring in its low temperature martensite state. FIG. 11B shows the distal end in its high temperature austenite state, which is its "memory" shape. In the illustrated embodiment the memory shape is where the coils axially expand to apply a force, such as to throw a switch or the like. Other hyperelastic SMA spring configurations, such as those which apply tension or which apply torsion when in their memory shapes, are within the scope of the invention.

#### Embodiment Providing Bendable Heat Pipe

FIGS. 12A and 12B show an embodiment comprising a heat pipe 87. The heat pipe is formed of a hyperelastic single CuAlNi SMA. With the pipe formed of this material, it can tolerate severe bending without failure. It is shown adapted for use on a spacecraft having a deployable 89 (only a part of which is shown) which is pivotally connected by a hinge 91 with a structure or frame 90. A gas or liquid is directed by the pipe across the hinge line, such as for use on the deployable. The hyperelastic properties enable bending of the pipe through a wide arc of travel, shown as 180 degrees. FIG. 12A shows the pipe in a bent shape with the deployable stowed. FIG. 12B shows the pipe bent to a straight shape after the deployable is pivoted out into its deployed position.

#### Embodiment Providing Flexures for Electrical Switches

FIGS. 13A and 13B show an embodiment comprising a pair of hyperelastic flexures 92, 94, such as for use in a small size electrical switch having a moving contact 96 for opening and closing a circuit. Each flexure is formed of a hyperelastic CuAlNi SMA. The hyperelastic properties enable the flexures and contact to be very small while allowing the flexures to easily yield by bending upon upward movement of the contact. This allows the switch to be more forgiving (and therefore more reliable in its operation) of any variations in switch part dimensions due to manufacturing tolerances. FIG. 13A shows the parts before the flexures are touched by the contact so that the circuit is open. FIG. 13B shows the flexures after being touched by and yieldably bent by the contact to close the circuit.

#### Embodiment Providing Leaf Spring

FIGS. 14A and 14B show an embodiment comprising a leaf spring 98. The spring is formed of a hyperelastic SMA. The hyperelastic properties enable extreme bending of the spring. As a result, the spring is optimum for use in aerospace applications where size and mass must be minimized. FIG. 14A shows the spring before bending. FIG. 14B shows the spring after being bent through a wide arc, illustrated as 180 degrees.

The constant force plateau of stress resulting from the hyperelastic properties also provides significant advantages in giving the spring an inherent "snap-action" feature. Further, the hyperelastic properties minimize the total energy stored when fully bent (i.e. strained up to

its failure point).

#### Embodiment Providing Plunger Actuator

FIGS. 15A and 15B show an embodiment comprising a plunger type actuator 100. The actuator is comprised of a main spring 102, shown as a coil spring although it could be in other configurations, mounted coaxially within a cylindrical shell housing 104. Spring 102 is formed of a hyperelastic SMA. A plunger 106 is slidably mounted within the housing so that elongation of the main spring drives the plunger's distal end 108 out through the end of the housing. A bias coil spring 110 is mounted within the housing on a side of the plunger opposite the main spring.

FIG. 15A shows the actuator with its components in standby mode before actuation. In this mode main spring 102 is in its low temperature martensite crystal phase with a strength which is sufficiently low to enable the bias spring to drive against and hold the main spring in its standby mode. FIG. 15B shows the spring after actuation by being heated by a suitable heater (not shown) above the SMA's phase transition temperature. The SMA then reverts to its austenite phase so that the main spring elongates to its memory shape and thereby forcefully acts against and moves the plunger out while also compressing the bias spring.

#### Embodiment Providing Collapsible Tube

FIGS. 16A, 16B and 16C show an embodiment comprising a collapsible tube 112, such as for use in various medical applications including stents. The tube is shown for use as an intravascular medical device that has a catheter 114 which carries the tube to the desired place in a human body. The tube is comprised of a cross mesh or web of strands that are formed of a hyperelastic SMA. The cross mesh allows the tube to be easily deformed and collapsed into a size which is sufficiently small to fit within the catheter, as shown in FIG. 16A. Upon being released from the constraining catheter the mesh begins to expand as the strands deform out toward their memory shapes, as at 112 in FIG. 16B. FIG. 16C shows the mesh after emerging fully expanded from the end of the catheter as at 112 upon placement in the patient's vasculature.

The hyperelastic properties of the mesh strands enable the tube to be collapsed to a much smaller size as compared to prior art catheters, such as those employing superelastic TiNi SMA or other materials.

#### Embodiment Providing Solid Hinge

FIGS. 17A and 17B show an embodiment comprising a solid hinge 120 for pivotally moving elements with respect to one another. The term "solid hinge" means that it has no separate elements or parts that move with respect to one another. The hinge 120 is formed of a hyperelastic SMA. One example of the solid hinge's use is as shown in the figures for pivoting a deployable 122 (only a part of which is shown) held on a spacecraft structure 124. FIG. 17A shows the hinge in a bent shape with the deployable stowed. FIG. 17B shows the hinge bent to a flat shape after the deployable is pivoted out into its deployed position.

The hyperelastic properties of the solid hinge enable it to bend through a wider arc of travel, shown as 180 degrees, than would be possible were it to be made of superelastic SMA such as TiNi or other high strength materials. The hinge has no separate moving parts as in a piano type hinge. This results in low maintenance requirements and greater operating reliability. This is important in deep space flights

where the deployable must be held by the hinge in stowed position for many years and then be depended on to properly operate when required.

The solid hinge's hyperelastic properties also enable it to bend back and forth indefinitely without losing its recoverability. The hyperelastic properties also enable the hinge to have a robust thickness, which is sufficient to provide strength for holding heavy loads while the hinge still can easily bend. These requirements of thickness/strength with ease of bending cannot be achieved by solid hinges made of other metals, metal alloys or polymer materials.

CLM What is claimed is:

1. A device comprising a mechanical component, the mechanical component being formed of a hyperelastic material having a crystalline phase change transition temperature.
2. A device as in claim 1 in which the hyperelastic material has an austenite crystalline phase when at a temperature above the phase change transition temperature, the material being in a martensite crystalline phase when at a temperature below the phase change transition temperature.
3. A device as in claim 1 in which the hyperelastic material has an austenite crystalline phase when below the material's phase change transition stress level, the material being in a martensite crystalline phase when at a mechanical stress above the material's phase change transition stress level.
4. A device as in claim 1 in which the hyperelastic material is a single crystal of CuAlNi alloy.
5. A device as in claim 4 in which the hyperelastic material is CuAlNi alloy and its crystallographic direction  $<100>$  of the crystal is aligned with the longitudinal axis of the guidewire.
6. A device as in claim 1 in which the hyperelastic material comprises copper, aluminum, and a metal selected from the group consisting of Ni, Fe, Co, and Mn.
7. A device as in claim 1 for use in medical procedures on a body of a human or other animal, the mechanical component comprises a guidewire which is sized for insertion into the body.
8. A device as in claim 7 in which the metallic components of the alloy are sufficiently proportioned to provide properties of flexibility and torqueability enabling optimum movement of the guidewire through the body.
9. A device as in claim 7 and further comprising a biocompatible coating formed about the guidewire, the coating being comprised of a material selected from the group consisting of gold, a biocompatible plastic, and a biocompatible polymer.
10. A device as in claim 7 in which the guidewire has one portion comprised of a hyperelastic SMA material having a phase change transition temperature no greater than the temperature of the body whereby the one portion when in the body is heated to the austenite phase and has hyperelastic properties.
11. A device as in claim 7 in which the guidewire has an other portion comprised of a hyperelastic material having a phase change transition temperature greater than the body temperature whereby the other portion

when in the body is in a martensite phase and has malleable properties.

12. A device as in claim 7 in which the guidewire has a given diameter, and the hyperelastic material when in the austenite phase has a recoverable distortion sufficient to enable the guidewire responsive to a stress being deformed by bending through an arc as much as 9 percent of the guidewire diameter divided by the arc diameter and further enabling the guidewire when unstressed to recover all of the deformation.

13. A device as in claim 7 in which the guidewire comprises one portion having a given diameter and an other portion, the other portion having a diameter that is less than the given diameter sufficient to enable the other portion responsive to a given stress to flex through a greater degree than when the one portion is flexed responsive to the given stress.

14. A device as in claim 7 in which the guidewire comprises one portion having a given diameter and an other portion, the other portion having a composition different from the first portion sufficient to enable the other portion responsive to a given stress to flex through a greater degree than when the one portion is flexed responsive to the given stress.

15. A device as in claim 7 in which the device further comprises a catheter having a hollow sleeve, and the guidewire is fitted for axial movement within the sleeve.

16. A method of fabricating a single crystal shape memory alloy having hyperelastic properties, the method comprising the steps of: providing a molten melt of a copper aluminum based alloy, pulling a column of the alloy from the melt at a predetermined pulling rate, applying a predetermined hydrostatic pressure on the column and heating the column to a predetermined temperature, the predetermined pulling rate, hydrostatic pressure and temperature being sufficient to crystallize the alloy in the column into a single crystal, and quenching the single crystal.

17. A method as in claim 16 in which the predetermined temperature is at least about 1000 degrees Celsius, and the quenching step is carried out by quenching from about 850 degrees Celsius.

18. A method as in claim 16 in which the compositions of the alloy are substantially 80 percent Cu, 15 percent Al and 5 percent of a metal selected from the group consisting of Ni, Co, Mn, Fe.

19. A method as in claim 16 in which the quenching step is carried out by quenching the alloy in salt water.

20. A method as in claim 16 in which the single crystal shape memory alloy is for use as a guidewire in medical procedures, the step of pulling the column is sufficient to form a length of wire, and grinding the surface of the wire to a diameter in the range of from 0.012 inches to 0.039 inches.

21. A method as in claim 16 in which the grinding step is carried out by centerless grinding of the surface.

22. A method as in claim 20 and further comprising the step of electropolishing the wire to a smoothness of less than 0.0001 inches.

23. A method as in claim 20 and further comprising the step of coating

the surface of the wire with a material selected from the group consisting of gold, a biocompatible plastic, and a biocompatible polymer.

24. A method as in claim 20 and further comprising the step of coating the surface of the wire with a lubricant.

25. A method as in claim 20 and further comprising the step of etching a portion of the surface of the wire in a mixture of hydrofluoric acid and nitric acid in amounts which reduce the diameter of the wire sufficient to increase the flexibility of the portion.

26. A method as in claim 16 in which the step of pulling the column is carried out by pulling a hollow cross-sectional elongated shaped column.

27. A method as in claim 20 in which the column has an outer layer comprised of CuAlNi polycrystal, and further comprising the step of removing the polycrystal in the outer layer.

28. A device as in claim 1 for use as a flexure in which the mechanical component comprises an elongated strip having an arcuate cross-section lateral of the strip's long axis, the strip having a given width and a thickness which is sufficiently thinner than the given width to enable the strip to buckle transversely of the long axis responsive to a first load while further enabling the strip to have a rigidity which resists the buckling responsive to a second load which is less than the first load.

29. A device as in claim 28 which further comprises a deployable structure, the deployable structure comprising first and second struts, and the flexure interconnects the first and second struts for flexure between a stowed orientation in which the struts are folded toward each other and a deployed orientation in which the struts extend substantially along a common axis.

30. A device as in claim 29 in which the deployable structure comprises a boom.

31. A device as in claim 29 in which the deployable structure comprises an antenna.

32. A device as in claim 29 in which the deployable structure comprises a solar panel.

33. A device as in claim 1 for use as an actuator, the device further comprising a first element, an actuation element which is mounted for movement relative to the first element between a stowed position and a deployed position, a bias element which applies a restoring force urging the actuation element toward the stowed position, and the mechanical component is in the form of a spring which applies a force of a given magnitude urging the actuation element toward the deployed position responsive to the hyperelastic material being in the austenite crystalline phase, and the mechanical component further applying a force less than the restoring force responsive to the hyperelastic material being in the martensite crystalline phase.

34. A device as in claim 1 for use as a combination heat pipe and flexure, the device comprising first and second elements, the mechanical component comprises a tubular joint having a hollow interior for constraining a fluid flow, the joint having a first end connected with the first element and a second end connected with the second element, the elements being pivotal about the axis between a deployed orientation

responsive to the hyperelastic material being in the austenite crystalline phase and a stowed orientation responsive to the hyperelastic material being in the martensite crystalline phase, and means for directing the flow of a fluid between the first and second ends of the joint.

35. A device as in claim 1 for use as an electrical switch to open and close a circuit path, the device further comprising a first contact which is connected with the circuit, the mechanical component further comprising a second contact, the second contact being positioned for movement toward a position spaced from the first contact to open the circuit responsive to the hyperelastic material being in the martensite crystalline phase, and the second contact being positioned for movement toward an other position in contact with the first contact to close the circuit responsive to the hyperelastic material being in the austenite crystalline phase.

36. A device as in claim 1 for use in applying a substantially constant force throughout a range of movement between first and second structures, the mechanical component further comprising a force-applying element having a first portion carried on the first structure and a second portion carried on the second structure, the force-applying element when the hyperelastic material is in the austenite crystalline phase being enabled to distort through a range of movement while applying a substantially constant force between the first and second structures.

37. A device as in claim 36 in which the force-applying element comprises a torsion spring.

38. A device as in claim 36 in which the force-applying element comprises a compression spring.

39. A device as in claim 36 in which the force-applying element comprises a tension spring.

40. A device as in claim 36 in which the force-applying element comprises a leaf spring.

41. A device as in claim 1 for use as a collapsible tube, the device further comprising a hollow tube having a first portion axially carried with a second portion, the second portion being comprised of the hyperelastic material, the second portion being shaped to expand outwardly to a deployed configuration having a given diameter responsive to the hyperelastic material being in the austenite crystalline phase, the second portion collapsing inwardly to a diameter smaller than the given diameter responsive to the hyperelastic material being in the martensite crystalline phase.

42. A device as in claim 41 in which the shape of the second portion comprises a plurality of interconnected strips separated by openings.

43. A device as in claim 1 for use as a probe tip in closing an electrical circuit with a contact pad of a microelectronic circuit on an integrated circuit chip, the mechanical component further comprising a cantilever beam having a longitudinal axis with a proximal end and a distal end, the crystalline direction <100> the crystal being parallel to the axis, the distal end being formed with a point which moves into contact with the pad for closing the circuit.

44. A device as in claim 1 for use in storing large amounts of mechanical energy in a relatively small volume, the mechanical component

further comprising a washer having a frusto-conical wall centered about a longitudinal axis, the wall flaring out from an opening of a given diameter at one end to an opening of a diameter larger than the given diameter at an opposite end, the wall responsive to an applied force along the axis gradually flattening while the ends move toward each other and the hyperelastic material in the austenite crystalline phase applying a constant resisting force against the applied force while storing mechanical energy from the applied force.

45. A device as in claim 1 for use in a structure for storing mechanical energy responsive to an applied force and releasing the stored energy responsive to the applied force being removed, the mechanical component further comprising a spring having one end carried by the structure and an other end, the other end being positioned to yieldably move in one direction responsive to the applied force, the hyperelastic material applying a constant resisting force against the applied force while storing mechanical energy from the applied force, and the hyperelastic material responsive to removal of the applied force causing the other end to move in an other direction while releasing the stored energy.

46. A device as in claim 45 in which the structure is selected from the group consisting of a bicycle wheel with spokes, athletic footwear, skis, and exercise equipment.

47. A device as in claim 1 for use as a pointed instrument, probe or needle, the mechanical component further comprising an elongated shaft extending along a longitudinal axis and having a distal end with a tip that has a sharp point, the tip being comprised of the hyperelastic material, the tip being enabled by the hyperelastic material in the austenite crystalline phase to bend away from the longitudinal axis through a large displacement responsive to a force externally applied on the tip, and, the tip returning to the initial position responsive to removal of the force.

48. A device as in claim 1 in which the mechanical component comprises an implantable medical tool for use in a human body.

49. A device as in claim 48 in which the medical tool comprises a stent.

INCL INCLM: 148/562.000  
INCLS: 148/563.000; 148/402.000  
NCL NCLM: 148/562.000  
NCLS: 148/402.000; 148/563.000  
IC IPCI C22F0001-00 [I,A]  
IPCR C22F0001-00 [I,C]; C22F0001-00 [I,A]  
CAS INDEXING IS AVAILABLE FOR THIS PATENT.

=> d scan 15  
YOU HAVE REQUESTED DATA FROM FILE 'HCAPLUS, USPATFULL, EPFULL, GBFULL' - CONTINUE?  
(Y)/N:y

L5 50 ANSWERS USPATFULL  
AN 2006:251080 USPATFULL  
TI Thin film intrauterine device  
NCL NCLM: 128/833.000  
IC IPCI A61F0006-06 [I,A]; A61F0006-00 [I,C\*]  
IPCR A61F0006-00 [I,C]; A61F0006-06 [I,A]  
GI SECTION PAGES FORMAT SIZE

FRONT PAGE	1	PAGE.FP	34K
DRAWINGS	2-3	PAGE.DRAW	28K
DESCRIPTION	4-6	PAGE.DESC	315K
CLAIMS	6-6	PAGE.CLM	96K
COMPLETE	1-6	PAGE.ALL	378K

Use PAGE(n) to retrieve a specific page

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):1

L5 50 ANSWERS USPATFULL  
 AN 2002:111418 USPATFULL  
 TI Thin film shape memory alloy actuated microrelay  
 NCL NCLM: 335/078.000  
 NCLS: 335/083.000  
 IC [7]  
 ICM H01H0051-22  
 IPCI H01H0051-22 [ICM, 7]  
 IPCI-2 H01H0051-22 [ICM, 7]  
 IPCR H01H0001-00 [I,C\*]; H01H0001-00 [I,A]; H01H0061-00 [I,C\*];  
 H01H0061-01 [I,A]

PAGE IMAGES NOT AVAILABLE FOR THIS PATENT

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):1

L5 50 ANSWERS HCPLUS COPYRIGHT 2009 ACS on STN  
 CC 76-3 (Electric Phenomena)  
 Section cross-reference(s): 56  
 TI Fabrication of silicon-based shape memory alloy micro-actuators  
 ST silicon shape memory alloy microactuator  
 IT Actuators  
 (micro-, from silicon and shape-memory alloys)  
 IT 12683-48-6  
 RL: USES (Uses)  
 (shape-memory alloy from, for silicon actuator)  
 IT 7440-21-3, Silicon, uses  
 RL: USES (Uses)  
 (shape-memory alloy micro-actuators from)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):0

=> d 15 9 it  
 YOU HAVE REQUESTED DATA FROM FILE 'HCPLUS, USPATFULL, EPFULL, GBFULL' - CONTINUE?  
 (Y)/N:y

L5 ANSWER 9 OF 50 USPATFULL on STN  
 IT Photoresists  
 (resist; preparation of fluorosulfonyloxyalkyl sulfonate salt type photoacid  
 generators for resist compns.)  
 IT 485819-08-7 795311-98-7 795311-99-8 873780-88-2 935279-79-1  
 935279-80-4 935280-50-5  
 (polymer for resist composition containing fluorosulfonyloxyalkyl sulfonate  
 salt  
 photoacid)  
 IT 4270-70-6P, Triphenylsulfonium chloride 19158-66-8P 22417-22-7P  
 61358-24-5P 199733-54-5P 364736-20-9P 469912-73-0P 850345-82-3P  
 911683-53-9P 935279-67-7P 935441-92-2P 935441-94-4P 935441-96-6P  
 935441-97-7P 935441-98-8P 935441-99-9P 935442-00-5P 935442-01-6P

935442-02-7P	935442-03-8P	935442-04-9P	935442-05-0P	935442-06-1P
935442-07-2P	935442-08-3P	935442-09-4P	935442-10-7P	
(preparation of fluorosulfonyloxyalkyl sulfonate salt type photoacid generators for resist compns.)				
IT 122085-43-2	370099-19-7	(preparation of fluorosulfonyloxyalkyl sulfonate salt type photoacid generators for resist compns.)		
IT 70-11-1	75-09-2, Dichloromethane, reactions	75-77-4, Trimethylsilyl chloride, reactions	77-78-1, Dimethyl sulfate	98-06-6 98-59-9, Tosyl chloride 100-68-5, Thioanisole 110-01-0 945-51-7, Diphenyl sulfoxide 1774-35-2, Bis-(4-methylphenyl) sulfoxide 3972-65-4, 4-tert-Butylbromobenzene 7758-05-6, Potassium iodate 18995-35-2, 4-tert-Butoxychlorobenzene 91815-55-3 185739-14-4 868049-02-9 935442-11-8
(preparation of fluorosulfonyloxyalkyl sulfonate salt type photoacid generators for resist compns.)				

=> d 15 10 it

YOU HAVE REQUESTED DATA FROM FILE 'HCAPLUS, USPATFULL, EPFULL, GBFULL' - CONTINUE?  
(Y)/N:y

'IT' IS NOT A VALID FORMAT

In a multifile environment, a format can only be used if it is valid in at least one of the files. Refer to file specific help messages or the STNGUIDE file for information on formats available in individual files.

REENTER DISPLAY FORMAT FOR ALL FILES (FILEDEFAULT):break

'BREAK' IS NOT A VALID FORMAT

In a multifile environment, a format can only be used if it is valid in at least one of the files. Refer to file specific help messages or the STNGUIDE file for information on formats available in individual files.

REENTER DISPLAY FORMAT FOR ALL FILES (FILEDEFAULT):end

=> d cost

COST IN U.S. DOLLARS	SINCE FILE ENTRY	TOTAL SESSION
CONNECT CHARGES	0.43	55.80
NETWORK CHARGES	0.07	2.52
SEARCH CHARGES	0.00	38.08
DISPLAY CHARGES	0.00	121.87
<hr/>		
FULL ESTIMATED COST	0.50	218.27
DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)	SINCE FILE ENTRY	TOTAL SESSION
CA SUBSCRIBER PRICE	0.00	-15.58

IN FILE 'CAPLUS' AT 11:12:30 ON 26 MAR 2009

=> file registry

COST IN U.S. DOLLARS	SINCE FILE ENTRY	TOTAL SESSION
FULL ESTIMATED COST	0.50	218.27
DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)	SINCE FILE ENTRY	TOTAL SESSION
CA SUBSCRIBER PRICE	0.00	-15.58

FILE 'REGISTRY' ENTERED AT 11:12:44 ON 26 MAR 2009  
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DICTIONARY FILE UPDATES: 24 MAR 2009 HIGHEST RN 1126602-40-1

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predicted properties as well as tags indicating availability of  
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on property searching in REGISTRY, refer to:

<http://www.cas.org/support/stngen/stndoc/properties.html>

=> s 80 Cu/mac and 15 Al/mac and 0-5 (Ni or Co or Mn or Fe)/mac)  
UNMATCHED RIGHT PARENTHESIS '/MAC)'

The number of right parentheses in a query must be equal to the  
number of left parentheses.

=> s 80 Cu/mac and 15 Al/mac and 0-5 (Ni or Co or Mn or Fe)/mac  
MISSING OPERATOR '0-5 (NI'

=> s 80 Cu/mac and 15 Al/mac and (0-5 Ni/mac OR 0-5 Co/mac or 0-5 Mn/mac or 0-5  
Fe/mac)

53212 80/MAC  
247136 CU/MAC  
4265 80 CU/MAC  
(80/MAC (P) CU/MAC)

78102 15/MAC  
269941 AL/MAC  
3982 15 AL/MAC  
(15/MAC (P) AL/MAC)

785477 0-5/MAC  
343751 NI/MAC  
153162 0-5 NI/MAC  
(0-5/MAC (P) NI/MAC)

785477 0-5/MAC  
137323 CO/MAC  
43884 0-5 CO/MAC  
(0-5/MAC (P) CO/MAC)

785477 0-5/MAC  
395683 MN/MAC  
351629 0-5 MN/MAC  
(0-5/MAC (P) MN/MAC)

785477 0-5/MAC  
561690 FE/MAC  
83703 0-5 FE/MAC  
(0-5/MAC (P) FE/MAC)

L11 96 80 CU/MAC AND 15 AL/MAC AND (0-5 NI/MAC OR 0-5 CO/MAC OR 0-5  
MN/MAC OR 0-5 FE/MAC)

=> file caplus, uspatall			
COST IN U.S. DOLLARS	SINCE FILE	TOTAL	
	ENTRY	SESSION	
FULL ESTIMATED COST	33.54	251.81	
DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)	SINCE FILE	TOTAL	
	ENTRY	SESSION	
CA SUBSCRIBER PRICE	0.00	-15.58	

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FILE 'USPATOLD' ENTERED AT 11:14:22 ON 26 MAR 2009  
 CA INDEXING COPYRIGHT (C) 2009 AMERICAN CHEMICAL SOCIETY (ACS)

FILE 'USPAT2' ENTERED AT 11:14:22 ON 26 MAR 2009  
 CA INDEXING COPYRIGHT (C) 2009 AMERICAN CHEMICAL SOCIETY (ACS)

=> s 111  
 L12 118 L11

=> s 112 and single crystal  
 => s 112 and (shape memory or SMA)  
 L13 15 L12 AND (SHAPE MEMORY OR SMA)

=> s 112 and single crystal  
 L14 0 L12 AND SINGLE CRYSTAL

=> d scan 113

L13 15 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
 CC 56-8 (Nonferrous Metals and Alloys)  
 TI Effect of alloying on the martensitic transformation temperatures in  
 copper-base shape-memory alloys  
 ST copper alloy structure shape memory; martensite  
 structure copper alloy  
 IT Martensitic structure  
 (in copper alloys, shape memory in relation to)  
 IT Memory effect, chemical and physical  
 (shape, of copper alloys, martensitic structure effect on)  
 IT 115638-26-1, Aluminum 11-14, copper 78-88, manganese 1.5-8 115638-27-2,  
 Aluminum 4.2-11, copper 62-85, zinc 11-27 115638-28-3, Aluminum  
 12-15, copper 80-86, nickel 2-5.1  
 RL: PRP (Properties)  
 (structure of, martensitic transformation in, shape  
 memory in relation to)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):0

=> file registry			
COST IN U.S. DOLLARS	SINCE FILE	TOTAL	
	ENTRY	SESSION	
FULL ESTIMATED COST	22.05	273.86	
DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)	SINCE FILE	TOTAL	
	ENTRY	SESSION	

CA SUBSCRIBER PRICE 0.00 -15.58

FILE 'REGISTRY' ENTERED AT 11:16:13 ON 26 MAR 2009  
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predicted properties as well as tags indicating availability of  
experimental property data in the original document. For information  
on property searching in REGISTRY, refer to:

<http://www.cas.org/support/stngen/stndoc/properties.html>

=> s cu.al/rc  
L15 704 CU.AL/RC

=> s cu.al./rc  
IS NOT A RECOGNIZED COMMAND  
The previous command name entered was not recognized by the system.  
For a list of commands available to you in the current file, enter  
"HELP COMMANDS" at an arrow prompt (=>).

=> s cu.al.ni/rc  
L16 400 CU.AL.NI/RC

=> s cu.al.co/rc  
L17 115 CU.AL.CO/RC

COST IN U.S. DOLLARS	SINCE FILE ENTRY	TOTAL SESSION
FULL ESTIMATED COST	17.01	290.87
DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)	SINCE FILE ENTRY	TOTAL SESSION
CA SUBSCRIBER PRICE	0.00	-15.58

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CA INDEXING COPYRIGHT (C) 2009 AMERICAN CHEMICAL SOCIETY (ACS)

FILE 'USPATOLD' ENTERED AT 11:17:10 ON 26 MAR 2009  
CA INDEXING COPYRIGHT (C) 2009 AMERICAN CHEMICAL SOCIETY (ACS)

FILE 'USPAT2' ENTERED AT 11:17:10 ON 26 MAR 2009  
CA INDEXING COPYRIGHT (C) 2009 AMERICAN CHEMICAL SOCIETY (ACS)

=> s 115  
L18 3055 L15

=> s 118 and (shape memory)  
L19 54 L18 AND (SHAPE MEMORY)

=> s 118 and single crystal  
L20 291 L18 AND SINGLE CRYSTAL

=> s 119 and 120  
L21 1 L19 AND L20

=> d 112

L12 ANSWER 1 OF 118 CAPLUS COPYRIGHT 2009 ACS on STN  
AN 2008:470337 CAPLUS  
DN 149:14367  
TI Thermodynamic properties of Al-Mn, Al-Cu, and Al-Fe-Cu melts and their  
relations to liquid and quasicrystal structure  
AU Zaitsev, A. I.; Zaitseva, N. E.; Shimko, R. Yu; Arutyunyan, N. A.; Dunaev,  
S. F.; Kraposhin, V. S.; Lam, Ha Thanh  
CS I P Bardin Central Research Institute for Ferrous Metallurgy, Moscow,  
Russia  
SO Journal of Physics: Condensed Matter (2008), 20(11), 114121/1-114121/4  
CODEN: JCOMEL; ISSN: 0953-8984  
PB Institute of Physics Publishing  
DT Journal  
LA English  
RE.CNT 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD  
ALL CITATIONS AVAILABLE IN THE RE FORMAT

=> d 121

L21 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2009 ACS on STN  
AN 1985:83059 CAPLUS  
DN 102:83059  
OREF 102:12987a,12990a  
TI Functional copper alloys and their uses  
PA Sumitomo Electric Industries, Ltd., Japan  
SO Jpn. Kokai Tokyo Koho, 3 pp.  
CODEN: JKXXAF  
DT Patent  
LA Japanese  
FAN.CNT 1  
PATENT NO. KIND DATE APPLICATION NO. DATE  
----- ----- ----- -----  
PI JP 59179771 A 19841012 JP 1983-57083 19830330  
PRAI JP 1983-57083 19830330

=> d scan 121

L21 1 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
IC C22F001-08; C22C009-01  
CC 56-3 (Nonferrous Metals and Alloys)  
TI Functional copper alloys and their uses  
ST copper aluminum shape memory  
IT Vibration

(damping of, by copper-aluminum alloy single crystals  
)  
IT Memory effect, chemical and physical  
(shape, copper-aluminum alloy single crystals for)  
IT 11146-00-2  
RL: USES (Uses)  
(melt drawing of single-crystal, for shape  
memory and vibration damping)

ALL ANSWERS HAVE BEEN SCANNED

=> s melt drawing/it  
L22 35 MELT DRAWING/IT

=> d scan 122

L22 35 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
CC 36-3 (Physical Properties of Synthetic High Polymers)  
TI In-situ SAXS analysis of extended-chain crystallization during  
melt-drawing of ultra-high molecular weight polyethylene  
ST ultrahigh mol wt polyethylene melt drawing crystn  
IT Crystallization  
Drawing of plastics and rubbers  
(in-situ SAXS anal. of extended-chain crystallization during melt-  
drawing of ultrahigh mol. weight polyethylene)  
IT Stress, mechanical  
(of ultrahigh mol. weight polyethylene during melt-  
drawing and profile with drawing time)  
IT X-ray scattering  
(small-angle; in-situ SAXS anal. of extended-chain crystallization during  
melt-drawing of ultrahigh mol. weight polyethylene)  
IT 9002-88-4, Polyethylene  
RL: PEP (Physical, engineering or chemical process); PRP (Properties);  
PROC (Process)  
(in-situ SAXS anal. of extended-chain crystallization during melt-  
drawing of ultrahigh mol. weight polyethylene)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):0

=> s 122 and shape memory  
L23 1 L22 AND SHAPE MEMORY

=> d 123

L23 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2009 ACS on STN  
AN 1985:83059 CAPLUS  
DN 102:83059  
OREF 102:12987a,12990a  
TI Functional copper alloys and their uses  
PA Sumitomo Electric Industries, Ltd., Japan  
SO Jpn. Kokai Tokkyo Koho, 3 pp.  
CODEN: JKXXAF  
DT Patent  
LA Japanese  
FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 59179771	A	19841012	JP 1983-57083	19830330
PRAI JP 1983-57083		19830330		

=> d scan 119

L19 54 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
CC 56-8 (Nonferrous Metals and Alloys)  
TI Shape memory effect and phase transformations in a  
copper-12.4 weight % aluminum alloy  
ST copper aluminum shape memory; martensitic  
transformation shape memory  
IT Martensitic structure  
(in copper-aluminum alloy, shape memory effect in  
relation to)  
IT Memory effect, chemical and physical  
(shape, in copper-aluminum alloy, martensitic phase transformation in  
relation to)  
IT 12608-84-3  
RL: USES (Uses)  
(shape memory effect and martensitic phase  
transformation in)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):1

L19 54 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
CC 56-12 (Nonferrous Metals and Alloys)  
TI Effect of rapid solidification processing on transformation  
characteristics of shape-memory alloys  
ST memory shape cast copper alloy  
IT Cast metals and alloys  
RL: USES (Uses)  
(copper alloys, transformation characteristics of rapidly solidified  
shape-memory)  
IT Memory effect, chemical and physical  
(shape, of rapidly solidified copper alloys)  
IT 12608-84-3 65352-34-3 87467-16-1 87467-17-2 87467-18-3  
RL: USES (Uses)  
(transformation characteristics of rapidly solidified shape-  
memory)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):1

L19 54 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
CC 56-8 (Nonferrous Metals and Alloys)  
Section cross-reference(s): 68  
TI Rapidly quenched shape-memory alloys  
ST shape memory alloy rapidly quenched; martensite rapid  
solidified memory alloy; copper alloy memory rapidly quenched; tin copper  
memory rapidly quenched; aluminum copper memory rapidly quenched; zinc  
copper memory rapidly quenched; nickel titanium memory rapidly quenched  
IT Memory effect, chemical and physical  
(of copper and nickel alloys, rapid solidification extension of composition  
range of)  
IT Martensitic structure  
(of shape-memory copper and nickel alloys, rapid  
solidification extension of composition range of)  
IT Casting process  
(rapid solidification, of shape-memory copper and  
nickel alloys, composition range extension by)  
IT 11110-85-3 12621-77-1 99796-16-4 99796-17-5  
RL: USES (Uses)  
(rapidly solidified shape-memory, composition range  
extension of)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):1

L19 54 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
CC 56-8 (Nonferrous Metals and Alloys)  
TI The dependence of the copper-aluminum shape memory alloy on stacking faults and on the order disorder transition  
ST copper aluminum shape memory ordering; martensitic phase copper aluminum memory  
IT Martensitic structure  
    (in copper-aluminum shape-memory alloy, effect of stacking fault and ordering on)  
IT Order  
    (in copper-aluminum shape-memory alloy, martensitic transition in relation to)  
IT Memory effect, chemical and physical  
    (shape, in copper-aluminum alloy, martensitic transition in relation to)  
IT 12728-78-8  
RL: USES (Uses)  
    (martensitic transition in shape-memory, effect of stacking fault and ordering on)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):1

L19 54 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
CC 65-7 (General Physical Chemistry)  
Section cross-reference(s): 56  
TI Influence of nickel and copper on liquid structure of CuAlNi shape memory alloys  
ST liq structure copper aluminum nickel memory alloy  
IT Bond  
    Clusters  
    Electronegativity  
    Liquid structure  
    Structure factor  
        (influence of nickel and copper on liquid structure of CuAlNi shape memory alloys)  
IT Shape memory alloys  
RL: PRP (Properties)  
    (influence of nickel and copper on liquid structure of CuAlNi shape memory alloys)  
IT 7440-50-8, Copper, properties 12608-84-3 77885-26-8  
RL: PRP (Properties)  
    (influence of nickel and copper on liquid structure of CuAlNi shape memory alloys)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):1

L19 54 ANSWERS CAPLUS COPYRIGHT 2009 ACS on STN  
CC 56-12 (Nonferrous Metals and Alloys)  
TI Effect of heat treatment on shape memory effect of Cu-Al-Mn alloy  
ST copper aluminum manganese alloy shape memory effect training  
IT Heat treatment  
    Martensitic transformation  
    Quenching (cooling)  
        Shape memory effect  
    Springs (mechanical)  
        (effect of heat treatment on shape memory effect of Cu-Al-Mn alloy)  
IT Shape memory alloys  
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP

(Physical process); PROC (Process)  
(effect of heat treatment on shape memory effect of  
Cu-Al-Mn alloy)  
IT 698999-60-9, Aluminum 35, copper 55, manganese 0-10, silicon 0-10  
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PYP  
(Physical process); PROC (Process)  
(effect of heat treatment on shape memory effect of  
Cu-Al-Mn alloy)

HOW MANY MORE ANSWERS DO YOU WISH TO SCAN? (1):0

=> d 119 1-54 ibib,abs

L19 ANSWER 1 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2008:545625 CAPLUS  
DOCUMENT NUMBER: 149:109207  
TITLE: Long-range ordering in  $\beta$ -Cu-Zn-Al: Experimental  
and theoretical study  
AUTHOR(S): Lanzini, F.; Romero, R.; Stipcich, M.; Castro, M. L.  
CORPORATE SOURCE: Instituto de Fisica de Materiales Tandil (IFIMAT),  
Facultad de Ciencias Exactas, Universidad Nacional del  
Centro de la Provincia de Buenos Aires, Buenos Aires,  
Pinto(B7000GHG) Tandil, 399, Argent.  
SOURCE: Physical Review B: Condensed Matter and Materials  
Physics (2008), 77(13), 134207/1-134207/8  
CODEN: PRBMDO; ISSN: 1098-0121  
PUBLISHER: American Physical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB The order-disorder transition temps. were measured by calorimetric and  
resistometric techniques for body centered cubic Cu-Zn-Al shape-memory  
alloys. The investigation includes the line of compns.  
 $Cu0.76-x/2-Znx-Al0.24-x/2$  ( $0 \leq x \leq 0.48$ ), i.e., the line with a  
constant conduction electron per atom ratio,  $e/a=1.48$ . Exptl. results are  
confronted with Monte Carlo simulations based on the Blume-Emery-Griffiths  
Hamiltonian. A set of exchange energies in first and second neighbors is  
calculated, which allows in close agreement reproduction of the exptl. phase  
diagram.  
REFERENCE COUNT: 29 THERE ARE 29 CITED REFERENCES AVAILABLE FOR THIS  
RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 2 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2008:467002 CAPLUS  
DOCUMENT NUMBER: 149:292018  
TITLE: The modeling of the deformation behavior of Cu-Al-Nb-X  
shape memory alloys containing  
primary particles  
AUTHOR(S): Lelatko, J.; Morawiec, H.  
CORPORATE SOURCE: Institute of Materials Science, University of Silesia,  
Katowice, 40-007, Pol.  
SOURCE: Materials Science & Engineering, A: Structural  
Materials: Properties, Microstructure and Processing  
(2008), A481-A482, 684-687  
CODEN: MSAPE3; ISSN: 0921-5093  
PUBLISHER: Elsevier B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB The modified model of the continuum mechanics approach based on the  
effective medium approxns. and supplemented by the dislocation plasticity  
model enabled anal. of the deformation course of the Cu-Al-Nb-X (where X =  
Ni, Co, Cr or Ti) alloys. By comparing the simulated and exptl.  
stress-strain curves for these alloys, the effect of particle size, volume

fraction and their elastic properties on the deformation response is analyzed.

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 3 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2008:466972 CAPLUS

DOCUMENT NUMBER: 149:430121

TITLE: Shape memory behaviour of Cu-Al wires produced by horizontal in-rotating-liquid-spinning

AUTHOR(S): Zeller, S.; Gnauk, J.

CORPORATE SOURCE: Max-Planck-Insitut fuer Eisenforschung GmbH, Duesseldorf, D-40237, Germany

SOURCE: Materials Science & Engineering, A: Structural Materials: Properties, Microstructure and Processing (2008), A481-A482, 562-566

CODEN: MSAPE3; ISSN: 0921-5093

PUBLISHER: Elsevier B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Rapidly quenched Cu-Al-based thin wires of approx. 100  $\mu\text{m}$  in diameter produced by in-rotating-liquid-spinning process (INROLISP) exhibit shape memory behavior. In contrast to the production mode used for preparing thin Cu-Al wires showing the shape memory effect described in recent publications, a horizontal arrangement of the INROLISP process was used for the fabrication on a laboratory

scale. The effects of the process parameters on the quality of the thin wires have been studied. SEM was performed to investigate the influence of rapid solidification on the grain size. In order to characterize the shape memory behavior, the characteristic transformation temps. were determined by differential scanning calorimetry and tensile tests. In performing these measurements, the INROLISP process parameters like melt jet velocity (Reynolds' number), flow velocity of the coolant, melt superheating and alloy compns. were taken into account.

REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 4 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2008:418114 CAPLUS

DOCUMENT NUMBER: 149:580687

TITLE: Electrical and mechanical properties of liquid rapidly quenched Cu-Al-Ni shape-memory alloys

AUTHOR(S): Kamal, Mustafa; Gouda, El-Said

CORPORATE SOURCE: Metal Physics Lab. Physics Department, Faculty of Science, Mansoura University, Egypt

SOURCE: Radiation Effects and Defects in Solids (2008), 163(3), 237-240

CODEN: REDSEI; ISSN: 1042-0150

PUBLISHER: Taylor & Francis Ltd.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB A series of Cu<sub>50</sub>Al<sub>150-x</sub>Ni<sub>x</sub> alloys with x being 0-20 atomic% exhibit a stress-driven thermoelastic martensitic transformation, which involves the ability to attain the desired shape at different temps. On cooling from a high temperature, the displacive character of the transition is achieved and confers it to the shape memory effect. The observed solidification rate effect on the martensitic state was also taken into account. It allows explaining its sensitivity to the thermal treatments, which change the relative stability of both the parent phases existing

prior to the transformation and the martensite. Elec. resistance and elastic modulus measurements are also quantified.

REFERENCE COUNT: 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 5 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2007:1349628 CAPLUS  
DOCUMENT NUMBER: 147:513490  
TITLE: Thermal circuit breaker with a component exhibiting shape memory effect and method of fabrication of such circuit breaker  
INVENTOR(S): Dutkiewicz, Jan  
PATENT ASSIGNEE(S): PAN Instytut Metalurgii I Inżynierii Materiałowejim.Aleksandra Krupkowskiego, Pol.  
SOURCE: Pol., 4pp.  
CODEN: POXXA7  
DOCUMENT TYPE: Patent  
LANGUAGE: Polish  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PL 192417	B1	20061031	PL 1999-336371	19991102
PRIORITY APPLN. INFO.:			PL 1999-336371	19991102

AB In a thermal circuit breaker with a component exhibiting shape memory effect, the said component constitutes a Cu alloy strip snugly fit from the outer side to a Cu base consisted of two bowed parts positioned so closely to each other that together they form a component having the shape of a semi-circle. In a method of fabrication of the circuit breaker with a component exhibiting shape memory effect, the rotating roll-cast Cu alloy strip having a plain shape upon casting is deformed at the temperature of the martensitic phase stability to a shape of prepared pattern made of a semicircular Cu sheet and positioned in direct contact with that pattern.

L19 ANSWER 6 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2007:345468 CAPLUS  
DOCUMENT NUMBER: 148:59037  
TITLE: Effect of Ag addition on the martensitic phase of the Cu-10wt.% Al alloy  
AUTHOR(S): Silva, R. A. G.; Cuniberti, A.; Stipcich, M.; Adorno, A. T.  
CORPORATE SOURCE: Departamento de Fisico-Quimica, Instituto de Quimica, UNESP, Araraquara, SP, 14801-970, Brazil  
SOURCE: Materials Science & Engineering, A: Structural Materials: Properties, Microstructure and Processing (2007), A456(1-2), 5-10  
CODEN: MSAPE3; ISSN: 0921-5093  
PUBLISHER: Elsevier B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English

AB Thermal anal. and compression tests at room temperature have been carried out for Cu-10 weight% Al and Cu-10 weight% Al-10 weight% Ag alloys samples. The results indicate that the decomposition reaction of the ( $\beta$ 1) parent phase is decreased suppressed and a martensite stabilization effect can be induced by Ag addition. The Cu-Al-Ag alloy shows some degree of shape memory capacity.

REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 7 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2006:1197152 CAPLUS  
 DOCUMENT NUMBER: 147:76952  
 TITLE: The corrosion behavior of Cu-Al and Cu-Al-Be  
 shape-memory alloys in 0.5M H<sub>2</sub>SO<sub>4</sub>  
 solution  
 AUTHOR(S): Kuo, H. H.; Wang, W. H.; Hsu, Y. F.; Huang, C. A.  
 CORPORATE SOURCE: Department of Materials Science and Engineering,  
 National Taiwan University, Taichung, 107, Taiwan  
 SOURCE: Corrosion Science (2006), 48(12), 4352-4364  
 CODEN: CRRSAA; ISSN: 0010-938X  
 PUBLISHER: Elsevier Ltd.  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 AB The corrosion behavior of Cu-Al and Cu-Al-Be (0.55-1.0 wt%) shape  
 -memory alloys in 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at 25 °C was studied  
 by means of anodic polarization, cyclic voltammetry, and alternative  
 current impedance measurements. The results of anodic polarization test  
 show that anodic dissoln. rates of alloys decreased slightly with  
 increasing the concns. of aluminum or beryllium. Severe intergranular  
 corrosion of Cu-Al alloy was observed after alternative current impedance  
 measurement performed at the anodic potential of 0.6 V. However, the  
 addition of a small amount of beryllium was effective to prevent the  
 intergranular corrosion. The effect of beryllium addition on the prevention  
 of intergranular corrosion is possibly attributed to the diffusion of  
 beryllium atoms into grain boundaries, which in turn deactivates the grain  
 boundaries.  
 REFERENCE COUNT: 28 THERE ARE 28 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 8 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
 ACCESSION NUMBER: 2006:142177 CAPLUS  
 DOCUMENT NUMBER: 144:297061  
 TITLE: Method for preparing Cu-Al-Ni-Mn shape  
 memory alloy film by alloying cold rolled  
 ultrathin lamination  
 INVENTOR(S): Wen, Yuhua; Li, Ning; Li, Dong; Xie, Wenling  
 PATENT ASSIGNEE(S): Sichuan University, Peop. Rep. China  
 SOURCE: Faming Zhuanli Shengqing Gongkai Shuomingshu, 7 pp.  
 CODEN: CNXXEV  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Chinese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
-----	-----	-----	-----	-----
CN 1644728	A	20050727	CN 2005-10020163	20050113
CN 1330781	C	20070808		

PRIORITY APPLN. INFO.: CN 2005-10020163 20050113  
 AB The title alloy film contains Al 11.5-14.5 weight%, Ni 0-5%, Mn 0-3%, and Cu  
 in balance. The title method comprises: (1) taking Al and Cu-Ni-Mn alloy  
 foil as raw materials, (2) alternately overlapping the foils, and bonding  
 by large deformation cold rolling, (3) repeating cold rolling by pleating  
 if necessary, (4) diffusion annealing at 773-923 K, and (5)  
 β-treating by solid solving together with quenching at 973-1,123 K to  
 have shape memory effect. The obtained alloy film has  
 controllable constituent, fine crystal grain, long fatigue life, large  
 surface and low cost.

L19 ANSWER 9 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
 ACCESSION NUMBER: 2004:418445 CAPLUS  
 DOCUMENT NUMBER: 142:160300

TITLE: Some aspects of sintering Cu-Al-Ni base shape memory alloys  
AUTHOR(S): Bouabdallah, M.; Cizeron, G.  
CORPORATE SOURCE: Laboratoire de Structure des Materiaux Metalliques, Departement de Metallurgie, Ecole Nationale Polytechnique, Algiers, Algeria  
SOURCE: Journal de Physique IV: Proceedings (2004), 113, 57-60  
CODEN: JPICEI; ISSN: 1155-4339  
PUBLISHER: EDP Sciences  
DOCUMENT TYPE: Journal  
LANGUAGE: French  
AB The Cu-Al-Ni base shape memory alloys prepared by powder sintering techniques have refined grain size as compared to the cast alloys, and these refined grains have a tendency to grow. Also, the sintered alloys have significant porosity due to formation of a liquid eutectic phase Al-Cu during the sintering. Adding Ni powder to the initial mixture along with application of higher heating rates decreases the alloy sensitivity to porosity formation and improves densification and homogenizing of the alloy. Results of dilatometric study of the Cu-13Al and Cu-13Al-4Ni sintered alloys are given.  
REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 10 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2004:334815 CAPLUS  
DOCUMENT NUMBER: 141:382725  
TITLE: High damping capacity of CuAlMn shape-memory alloys  
AUTHOR(S): Zheng, Cheng-qi; Cheng, Xiao-nong  
CORPORATE SOURCE: Department of Materials Science and Engineering, Jiangsu University, Zhenjiang, 212013, Peop. Rep. China  
SOURCE: Zhongguo Youse Jinshu Xuebao (2004), 14(2), 194-198  
CODEN: ZYJXFK; ISSN: 1004-0609  
PUBLISHER: Kexue Chubanshe  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
AB The damping properties of CuAlMn shape-memory alloys both in martensite and parent phase were investigated using cantilever resonant-bar technique. The Cu-10.5Al-6Mn and Cu-11Al-8Mn (weight%) shape-memory alloys exhibit high damping capacity both in the martensite and the parent phase, with internal friction (Q-1) approx. as high as 10-1 when the applied stress amplitude is 4.05 MPa. The damping capacity decreases with increasing surface stress amplitude in either martensite or parent phase, while it decreases faster in the alloy with parent phase.

L19 ANSWER 11 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2003:987912 CAPLUS  
DOCUMENT NUMBER: 141:26893  
TITLE: Effect of heat treatment on shape memory effect of Cu-Al-Mn alloy  
AUTHOR(S): Li, Lihui; Wan, Farong; Long, Yi  
CORPORATE SOURCE: University of Science and Technology Beijing, Beijing, 100083, Peop. Rep. China  
SOURCE: Youse Jinshu (2003), 55(4), 13-16  
CODEN: YSCSAE; ISSN: 1001-0211  
PUBLISHER: Youse Jinshu Bianjibu  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
AB The effect of heat treatment on shape memory effect of 55% Cu-35% Al-10% (Mn + Si) alloy is investigated with a device designed

to measure shape change effect of shape memory alloy, cryogenic elec. resistance, cryogenic dilatometric measuring, X-ray diffraction, and SEM. The optimum heat treatment process is 950°C for 10 min + water quenching + 200°C annealing for 10 min; the martensitic transformation temperature is approx. 100K for the treated alloy. The designed device is proved to be effective in shape change effect measuring of shape memory alloy.

L19 ANSWER 12 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2003:700775 CAPLUS  
DOCUMENT NUMBER: 140:167573  
TITLE: Micro-inhomogeneity of liquid CuAlNi alloy for shape memory  
AUTHOR(S): Pan, Xuemin; Bian, Xiufang; Sun, Jingqin  
CORPORATE SOURCE: Dalian University of Technology, Dalian, 116024, Peop. Rep. China  
SOURCE: Xiyou Jinshu Cailiao Yu Gongcheng (2003), 32(7), 494-497  
CODEN: XJCGEA; ISSN: 1002-185X  
PUBLISHER: Kexue Chubanshe  
DOCUMENT TYPE: Journal  
LANGUAGE: Chinese  
AB The liquid structure of pure Cu, pure Al, Cu75Al25, and Cu71Al25Ni4 alloys (atomic%) were investigated with a θ-θ diffractometer and their structure factors were obtained in this paper. The exptl. results showed that in front of the main peaks on the melt structure factors, the X-ray pattern curves take parabolic shape for the pure Al and Cu and have a distinct pre-peak for the molten Cu75Al25, whose intensity increases by adding Ni (Cu71Al25Ni4). According to the characteristics of pre-peaks, an atomic model can be proposed for the liquid CuAlNi consisting of the octahedrons with shared vertexes and a random dense atom distribution region.

L19 ANSWER 13 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2003:425475 CAPLUS  
DOCUMENT NUMBER: 139:120751  
TITLE: Influence of liquid structure on solid transformation of CuAlNi shape memory alloy  
AUTHOR(S): Pan, Xuemin; Bian, Xiufang; Wang, Weimin; Qin, Jingyu  
CORPORATE SOURCE: State Key Laboratory of Materials Modification by Laser, Ion and Electron Beams, Dalian University of Technology, Dalian, 116023, Peop. Rep. China  
SOURCE: Journal of Materials Science & Technology (Shenyang, China) (2003), 19(2), 147-149  
CODEN: JSCTEQ; ISSN: 1005-0302  
PUBLISHER: Journal of Materials Science & Technology  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Molten Cu-13Al and Cu-13Al-4Ni (mass fraction) alloys were investigated using x-ray diffraction method. A distinct pre-peak was found in the structure factors.. The pre-peak increases its intensity with decreasing temperature and addition of Ni. The structural unit size corresponding to the pre-peak equals to magnitude of (111) planar distance of  $\beta$  phase. The appearance of a pre-peak is due to existence of clusters with  $\beta$ -phase-like structure in melt. Quantity and size of clusters increase with decreasing temperature but their structural unit size remains constant Cu-13Al-4Ni shape memory alloy ribbons can be fabricated by rapid solidification technique. Order degree of martensite and temperature of the reverse martensitic transformation increase with decreasing liquid quenching temperature  $\beta$ -Phase particles develop from, incorporating and growing of the clusters during solidification, thus result in the correlation between liquid structure and solid transformation.

REFERENCE COUNT: 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 14 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2003:11977 CAPLUS  
DOCUMENT NUMBER: 138:208586  
TITLE: Origin of pre-peak in structure factors of liquid Cu - Al - Ni alloys  
AUTHOR(S): Pan, X. M.; Bian, X. F.; Qin, J. Y.; Wang, W. M.  
CORPORATE SOURCE: Key Laboratory of Liquid Structure and Heredity of Materials, Ministry of Education, Shandong University, Jinan, 250061, Peop. Rep. China  
SOURCE: Materials Science and Technology (2002), 18(11), 1301-1304  
CODEN: MSCTEP; ISSN: 0267-0836  
PUBLISHER: Maney Publishing  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Molten Cu - Al - Ni alloys have been investigated using the X-ray diffraction method. A distinct pre-peak has been found around a scattering vector magnitude of 18.5 nm<sup>-1</sup> in the structure factor. The pre-peak increases in its intensity with decreasing temperature and the addition of Ni. The appearance of a pre-peak is a mark of medium range order. The structural unit size corresponding to the pre-peak is equal in magnitude to the (111) interplanar lattice spacing of the  $\beta$  phase. The appearance of a pre-peak is due to the existence of a cluster with a  $\beta$  phase-like structure in the melt. The size of the clusters increases with decreasing temperature but their structural unit size remains constant. Shape memory alloy ribbons can be fabricated by the rapid solidification technique. At a quenching temperature corresponding

to that of the lower pre-peak, the structure of the martensite obtained has a lower degree of order and the temperature of the reverse martensitic transformation is lower. At a quenching temperature corresponding to a higher pre-peak, the structure of the martensite obtained has a higher degree of order and temperature of the reverse martensitic transformation is higher. These clusters can become crystal seeds of the  $\beta$  phase and  $\beta$  phase develops from these clusters, thus resulting in a correlation between the pre-peak and martensitic transformation.

REFERENCE COUNT: 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 15 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2002:871351 CAPLUS  
DOCUMENT NUMBER: 138:110395  
TITLE: Correlation between liquid structure and  $\gamma_2$ -phase precipitation of Cu-Al-Ni shape memory alloys  
AUTHOR(S): Pan, Xue-min; Bian, Xiu-fang; Sun, Jing-qin; Wang, Wei-min  
CORPORATE SOURCE: Key Laboratory of Liquid Structure and Heredity of Materials, Ministry of Education, Shandong University, Ji'nan, 250061, Peop. Rep. China  
SOURCE: Transactions of Nonferrous Metals Society of China (2002), 12(5), 829-832  
CODEN: TNMCEW; ISSN: 1003-6326  
PUBLISHER: Science Press  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Cu<sub>71</sub>Al<sub>12</sub>Ni<sub>4</sub> (mole fraction, %) shape memory alloy ribbons exhibit a good shape memory effect, which were prepared by melt-spinning technique. The microstructure of the as-spun

ribbons was identified by D/Max-rA x-ray diffractometer. The order degree of martensite increases with decreasing liquid quenching temperature at the same

quenching rate. The liquid structure of Cu75Al25 and Cu71Al25Ni4 was investigated using x-ray diffraction method. The distinct pre-peaks were found in front of main peaks of the structure factors. The pre-peak increases intensity with decreasing temperature or adding Ni. Gaussian peaks decomposing radial distribution function (RDF) indicated that Cu-Al distance is anomalously short. These results suggest that a strong interaction between Cu and Al is favorable to form  $\beta$ -phase-like clusters, which leads to chemical medium-range ordering in melt. This promotes formation of order martensite and suppresses  $\gamma_2$ -phase precipitation

REFERENCE COUNT: 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 16 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2002:485457 CAPLUS

DOCUMENT NUMBER: 137:173058

TITLE: Microstructure of liquid CuAlNi shape memory alloy

AUTHOR(S): Pan, Xue-Min; Bian, Xiu-Fang; Wang, Li

CORPORATE SOURCE: Key Lab. of Liquid Structure and Heredity of Materials, Ministry of Education, Shandong Univ., Jinan, 250061, Peop. Rep. China

SOURCE: Wuli Huaxue Xuebao (2002), 18(6), 508-512

CODEN: WHXUEU; ISSN: 1000-6818

PUBLISHER: Beijing Daxue Chubanshe

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Molten CuAlNi alloys were investigated by x-ray diffractometer. Distinct pre-peaks were found in the structure factors. For the liquid alloy Cu75Al25, the intensity of pre-peak decreases with increasing temperature but exists clearly up to temperature of 1300°. This behavior indicates the existence of medium-range order clusters up to nearly 250° above liquidus temperature. The amount and size of atomic clusters increase as the concentration

of ni increases. The addition of Ni can improve the interaction between atoms, so it is favorable to the ability of medium-range order formation. According to the characteristics of the pre-peak, the atomic model of liquid CuAlNi is constructed, namely, the structure of liquid CuAlNi is a combination of clusters consisting of octahedrons with shared vertexes and other atoms with random dense atom distribution.

REFERENCE COUNT: 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 17 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 2002:461948 CAPLUS

DOCUMENT NUMBER: 137:128229

TITLE: Cu-based high-temperature shape-memory alloys and their thermal stability

AUTHOR(S): Xu, Huibin

CORPORATE SOURCE: Department of Materials Science and Engineering, Beijing University of Aeronautics and Astronautics, Beijing, 100083, Peop. Rep. China

SOURCE: Materials Science Forum (2002), 394-395(Shape Memory Materials and Its Applications), 375-382

CODEN: MSFOEP; ISSN: 0255-5476

PUBLISHER: Trans Tech Publications Ltd.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The newly developed CuAlNb, CuAlAg, CuAlCo and CuAlZr high temperature shape memory alloys are briefly reported. It was found

in CuAlNb shape memory alloys that the phase transformation temperature of A $\rightarrow$ M is near 573 K, which almost keeps unchanged with Nb content up to 1.7wt.%. The tensile strength and the elongation of CuAlNb alloy containing 1.7wt.% Nb are 958 MPa and 8.3%, resp., and the maximum recovery rate of 73.3% is obtained with 5% prestrain. The martensitic transformation temps. are in the range of 549.apprx.509 K for the CuAlAg alloy with Ag contents 3.apprx.5wt.%, and the Ag addition effectively increases the stability of the martensitic transformation at high temperature. But the plasticity is poor for the polycryst. CuAlAg alloy. The CuAlCo and CuAlZr alloys tested exhibit martensitic transformation temps. higher than 490 K. The CuAlCo alloy shows a moderate thermal stability compared with CuAlZr alloy. The former can experience five thermal cycles in the present experiment, but the latter exhibits no martensitic transformation in the second thermal cycle.

REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 18 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2002:204257 CAPLUS  
DOCUMENT NUMBER: 136:359976  
TITLE: Influence of nickel and copper on liquid structure of CuAlNi shape memory alloys  
AUTHOR(S): Pan, Xuemin; Bian, Xiufang  
CORPORATE SOURCE: Key Laboratory of Liquid Structure and Heredity of Materials, Education Ministry, Shandong University, Ji'nan, 250061, Peop. Rep. China  
SOURCE: Chinese Science Bulletin (2002), 47(1), 85-88  
CODEN: CSBUEF; ISSN: 1001-6538  
PUBLISHER: Science in China Press  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Liquid structure of molten pure Cu, Cu-12Al, Cu-12Al-4Ni (mass fraction, %) alloys has been investigated using the X-ray diffraction method. It is found that the main peak of the structure factor of pure Cu is sym. In the front of main peak, the curve takes on a shape of parabola, whereas a distinct pre-peak has been found around a scattering vector magnitude of 18.5 nm $^{-1}$  in the structure factor of the liquid Cu-12Al alloy. This pre-peak increases its intensity with the addition of Ni in the liquid Cu-12Al-4Ni alloy. The appearance of a pre-peak is a mark of the mediate-range order. Based on Daken-Gurry theory and according to mutual interaction between unlike atoms, the anal. of correlation between different composition and liquid structure was done: the strong interaction exists between Cu and Ni, so Cu-Al can form strong chemical bond which causes compound-forming behavior. Therefore, the medium-range size clusters can form in melt. The presence of the pre-peak corresponds to these clusters. The addition of Ni can strengthen the interaction between unlike atoms and increase the sizes of clusters, thus result in the height of pre-peak increasing.

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 19 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2001:913809 CAPLUS  
DOCUMENT NUMBER: 136:88961  
TITLE: New Cu-Al-Nb shape memory alloys  
AUTHOR(S): Lelatko, J.; Morawiec, H.; Koval, Yu. N.; Kolomytsev, V. I.  
CORPORATE SOURCE: Inst. Phys. and Chem. of Metals, Univ. of Silesia, Pol.  
SOURCE: Materialovedenie (2000), (6), 23-25  
CODEN: MATEC5  
PUBLISHER: OOO Nauka i Tekhnologii

DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB New Cu-Al alloys containing Nb show high shape recovery effect >200° are developed by induction melting. These alloys exhibit very good shape recovery effect, mech. properties and high plasticity.  
REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 20 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 2000:117954 CAPLUS  
DOCUMENT NUMBER: 132:254336  
TITLE: High-temperature Cu-Al-Nb shape memory alloys  
AUTHOR(S): Morawiec, H.; Leltko, J.; Koval, Yu.; Kolomytzev, V.  
CORPORATE SOURCE: Institute of Physics and Chemistry of Metals, University of Silesia, Katowice, PL-40 007, Pol.  
SOURCE: Materials Science Forum (2000), 327-328(Shape Memory Materials), 291-294  
CODEN: MSFOEP; ISSN: 0255-5476  
PUBLISHER: Trans Tech Publications Ltd.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Recently a great interest is focused on shape memory alloys for high temperature applications. The studied Cu-Al-Nb alloys contain from 0.27 to 7.86 wt% Nb and exhibit the Ms temperature of 300 °C. These alloys are characterized by exceptional high plasticity and shape recovery. The reason for that are the particles of primary ppts. distributed in the martensitic matrix which consists of 18R and a few of 2H plates. The relative coarse ppts. of Nb(Cu, Al)<sub>2</sub> and Nb(Cu, Al) phases are inherited by the martensite and do not interfere with the thermoelastic reversibility and shape memory. The microstructure of the Nb(Cu, Al)<sub>2</sub> particles is characterized by high stacking faults which is the evidence that they play active role in the process of deforming of those alloys and are responsible for their high plasticity.  
REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 21 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1998:773679 CAPLUS  
DOCUMENT NUMBER: 130:69766  
TITLE: Order-disorder transitions of Cu-Al-Mn shape-memory alloys  
AUTHOR(S): Obrado, Eduard; Frontera, Carlos; Manosa, Lluis; Planes, Antoni  
CORPORATE SOURCE: Facultat de Fisica, Departament d'Estructura i Constituents de la Materia, Universitat de Barcelona. Diagonal, 647, Barcelona, Catalonia, E-08028, Spain  
SOURCE: Physical Review B: Condensed Matter and Materials Physics (1998), 58(21), 14245-14255  
CODEN: PRBMDO; ISSN: 0163-1829  
PUBLISHER: American Physical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB The order-disorder transitions in Cu-Al-Mn shape-memory alloys were studied exptl. by calorimetric techniques. Results are compared with Monte Carlo simulations of a simplified Blume-Emery-Griffiths model. A first order D03 dblharw. A2 transition is obtained for the stoichiometric Cu3Al alloy, while for concns. near Cu2AlMn two second order transitions are found: L21dhaB2 and B2.dblharw. A2. Despite the simplicity of the model, the agreement between exptl. and simulation results is remarkably good. Finally, the metastable

phase diagram of bcc Cu-Al-Mn alloys is presented.

REFERENCE COUNT: 36 THERE ARE 36 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L19 ANSWER 22 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1995:876343 CAPLUS  
DOCUMENT NUMBER: 123:319289  
ORIGINAL REFERENCE NO.: 123:57125a,57128a  
TITLE: Peculiarities of martensitic transformation and parameters of the SME in Fe-based and B2-type-based alloys  
AUTHOR(S): Koval, Yu. N.  
CORPORATE SOURCE: Institute Metal Physics, National Academy Sciences Ukraine, Kiev, 252680/142, Ukraine  
SOURCE: Applied Crystallography (1995), Volume Date 1994, 16th, 223-8  
CODEN: APCRE2  
PUBLISHER: World Scientific  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Presence of oriented fixed network of dislocations eliminates, in fact, the necessity of deformation with invariant lattice that leads to essential decrease of transformation hysteresis and increases reversibility at motion of interphase boundaries. This results in increase of the degree of shape recovery up to 100%. This statement is confirmed by preservation of austenite needle after completion of the reverse martensite transformation as a result of thermal cycling treatment.

L19 ANSWER 23 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1993:259220 CAPLUS  
DOCUMENT NUMBER: 118:259220  
ORIGINAL REFERENCE NO.: 118:44991a,44994a  
TITLE: The microstructure and plasticity in a copper-12% aluminum alloy  
AUTHOR(S): Fujiwara, Shoji  
CORPORATE SOURCE: Kochi Natl. Coll. Technol., Nangoku, Japan  
SOURCE: Gakujutsu Kiyo - Kochi Kogyo Koto Senmon Gakko (1993), 37, 91-6  
CODEN: KKOCAK; ISSN: 0454-1170  
DOCUMENT TYPE: Journal  
LANGUAGE: Japanese  
AB The deformation behavior in Cu-12%Al alloy was studied by optical microscopy, hardness tester, x-ray measurement and thermal elec. resistivity measurement. The mech. properties of this alloy were found to be very brittle, but the experiment at high temperature showed that the alloy became very ductile with hardly work-hardening. Rapidly quenched specimens produced by high-speed wheel technique showed good mech. properties and clearly shape memory effect. The martensite structure in this alloy was observed to be changed by deformation.

L19 ANSWER 24 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1991:190398 CAPLUS  
DOCUMENT NUMBER: 114:190398  
ORIGINAL REFERENCE NO.: 114:32057a,32060a  
TITLE: Neutron diffraction study of phase transformations in a copper-12.6% aluminum shape-memory alloy  
AUTHOR(S): Lodini, A.; Andre, G.; Perrin, M.; Rimlinger, L.  
CORPORATE SOURCE: Lab. Sci. Mater., Ec. Super. Ing., Reims, Fr.  
SOURCE: Memoires et Etudes Scientifiques de la Revue de

Metallurgie (1990), 87(11), 701-8  
CODEN: MESMDJ; ISSN: 0245-8292

DOCUMENT TYPE: Journal  
LANGUAGE: French

AB The microstructure of shape-memory Cu-12.6%Al alloy was studied by using microcalorimetry, dilatometry, electron diffraction, neutron diffraction, and TEM. The undeformed martensitic structure had a monochronic primitive diffraction pattern, with streaks around the (000) spot which shows a periodicity of .apprx.3.5 nm. The latter is represented by a propagation vector parallel to the c-axis and is characteristic of a superlattice. After deformation, the primitive diffraction changed toward an orthorhombic structure during heating, and a brittle  $\delta$ -phase appeared. The memory effect was not observed in cubic martensitic transformation, but was observed at the order-disorder transition of the martensitic phase, as shown by the streaks around the (000) spot at 600°.

L19 ANSWER 25 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1990:616268 CAPLUS

DOCUMENT NUMBER: 113:216268

ORIGINAL REFERENCE NO.: 113:36473a, 36476a

TITLE: The dependence of the copper-aluminum shape memory alloy on stacking faults and on the order disorder transition

AUTHOR(S): Lodini, A.; Perrin, M.; Andre, G.; Rimlinger, L.

CORPORATE SOURCE: Lab. Sci. Mater., Inst. Super. Ing. Reims, Reims, F-51100, Fr.

SOURCE: Materials Science Forum (1990), 56-58 (Martensitic Transform., Pt. 2), 451-6

CODEN: MSFOEP; ISSN: 0255-5476

DOCUMENT TYPE: Journal

LANGUAGE: English

AB At room temperature, the quenched undeformed Cu-Al alloy is characterized by an ordered martensitic structure which appears as stacking fault stripes. The crystal structure was determined by the neutron diffraction technique. A specific exptl. set-up is used to minimize the texture and to study polycryst. massive specimens. The undeformed quenched alloy is monoclinic. After deformation a move to an orthorhombic structure and a satellite peak  $000\pm$  with a period close to 35 Å was observed. During the heating, the changes of the structure were characterized by dilatometry, microcalorimetry, TEM, and neutron diffraction. The transformation from the deformed martensitic structure into a cubic structure was characterized by 4 levels of energy.

L19 ANSWER 26 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1989:158662 CAPLUS

DOCUMENT NUMBER: 110:158662

ORIGINAL REFERENCE NO.: 110:26197a, 26200a

TITLE: Electronic structure of the valence band of copper-aluminum and copper-aluminum-nickel alloys according to x-ray and electron spectroscopic data

AUTHOR(S): Domashevskaya, E. P.; Komarov, V. V.; Narmonev, A. G.; Terekhov, V. A.

CORPORATE SOURCE: Voronezh. Gos. Univ., Voronezh, USSR

SOURCE: Fizika Metallov i Metallovedenie (1988), 66(6), 1225-8

CODEN: FMMTAK; ISSN: 0015-3230

DOCUMENT TYPE: Journal

LANGUAGE: Russian

AB The distribution of the integral d. of states and partial d. of 3s- and 3p-states of Al depending on the phase composition was studied to elucidate the electron structure of the valence band of CuAl and CuNiAl alloys. The emission x-ray spectra of Al reflecting the 3s- and 5p-state distribution

had a 2-band structure in the alloys. In Ni-containing spectra, the localization of the 3s-states and resonance push-out of 3p-electrons of Al by 3d-electrons of Cu, as well as of Al 3s-electrons by 3d-states of Ni, to the Fermi level was observed along with the pushing 3p-electrons of Al by Ni d-states away from the Fermi level. This caused the stabilization of the structure possessing the pseudoelasticity and shape memory effect.

L19 ANSWER 27 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1988:574709 CAPLUS  
DOCUMENT NUMBER: 109:174709  
ORIGINAL REFERENCE NO.: 109:28903a,28906a  
TITLE: High resolution electron microscopic study of the X-phase in copper-aluminum and copper-aluminum-zinc alloys  
AUTHOR(S): De Graef, M.; Delaey, L.; Broddin, D.  
CORPORATE SOURCE: Dep. Met. Mater. Eng., Catholic Univ. Leuven, Heverlee, B-3030, Neth.  
SOURCE: Physica Status Solidi A: Applied Research (1988), 107(2), 597-609  
CODEN: PSSABA; ISSN: 0031-8965  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Stabilization of the martensitic phase in Cu-Al and Cu-Al-Zn shape memory alloys limits the application of those alloys. It is believed that the stabilization effects may be interpreted as precursors of the formation of a metastable phase with a long period superlattice. To understand the mechanism of stabilization a careful anal. of this metastable X-phase was carried out by TEM. In the early stages hairpin-like modifications are observed at the original anti-phase domain boundaries. Complete filling of these domains with hairpins results in the formation of the long period superlattice phase. The composition dependence of the superstructure period,  $M$ , was verified.

L19 ANSWER 28 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1988:514631 CAPLUS  
DOCUMENT NUMBER: 109:114631  
ORIGINAL REFERENCE NO.: 109:19037a,19040a  
TITLE: Shape memory effects in rapidly quenched copper-12%aluminum and copper-12%aluminum-1%silicon alloys  
AUTHOR(S): Fujiwara, Shoji; Miwa, Shintaro  
CORPORATE SOURCE: Dep. Mech. Eng., Kochi Tech. Coll., Kochi, 783, Japan  
SOURCE: Materials Science and Engineering (1988), 98, 509-13  
CODEN: MSCEAA; ISSN: 0025-5416  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Cu-12%Al and Cu-12Al-1%Si alloys were rapidly quenched to examine the effect of rapid quenching on microstructure, mech. properties, and shape memory effects. The rapidly quenched specimens of the Cu-12%Al alloy were observed by optical microscopy to have a grain size of 10-20  $\mu\text{m}$  and by transmission electron microscopy to be twinned martensites. These specimens showed a considerable increment in ductility and obvious shape memory phenomenon. In the Cu-12Al-1%Si alloy, the martensite transition temperature,  $Ms$ , was .apprx.100 K lower than in the Cu-12%Al alloy and in the rapidly quenched specimens the shape memory phenomenon was clearly observed

L19 ANSWER 29 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1987:124384 CAPLUS  
DOCUMENT NUMBER: 106:124384  
ORIGINAL REFERENCE NO.: 106:20257a,20260a

TITLE: Copper-base shape-memory alloy  
 INVENTOR(S): Sasano, Hisatomo; Suzuki, Toshiyuki; Arai, Hitoshi  
 PATENT ASSIGNEE(S): National Research Institute for Metals, Japan  
 SOURCE: Jpn. Kokai Tokkyo Koho, 4 pp.  
 CODEN: JKXXAF  
 DOCUMENT TYPE: Patent  
 LANGUAGE: Japanese  
 FAMILY ACC. NUM. COUNT: 1  
 PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 61204356	A	19860910	JP 1985-43673	19850307
JP 01014971	B	19890315		

PRIORITY APPLN. INFO.: JP 1985-43673 19850307  
 AB Cu or Cu-base alloy parts are alloyed with Zn by vapor-phase coating and diffusion of the Zn to manufacture shape-memory alloy parts. Thus, a Cu-6.4% Al alloy wire coil and a Zn target in a quartz tube were heated 40 h at 869 and 700°, resp. The coil spring was then quenched with water to obtain a product, which after 10-time elongation at 0° recovered its original shape by slow heating to 30°.

L19 ANSWER 30 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
 ACCESSION NUMBER: 1986:557389 CAPLUS  
 DOCUMENT NUMBER: 105:157389  
 ORIGINAL REFERENCE NO.: 105:25319a,25322a  
 TITLE: Microstructure and mechanical properties of rapidly quenched shape memory alloys  
 AUTHOR(S): Eucken, S.; Hornbogen, E.  
 CORPORATE SOURCE: Inst. Werkstoffe, Ruhr-Univ. Bochum, Bochum, Fed. Rep. Ger.  
 SOURCE: Strength Met. Alloys, Proc. Int. Conf., 7th (1986), Meeting Date 1985, Volume 2, 1615-20. Editor(s): McQueen, H. J. Pergamon: Oxford, UK.  
 CODEN: 55FOAV

DOCUMENT TYPE: Conference  
 LANGUAGE: English  
 AB The microstructure and mech. properties of shape-memory (SM) alloys produced by melt spinning were studied. Homogeneous structures of the  $\beta$ -phases were aspired in the alloy systems Cu-Sn, Cu-Al, Cu-Al-Ni, Cu-Zn-Al, and Ni-Ti. Besides the undesired heterogeneous microstructures (1. single columnar, 2. double columnar, 3. equiaxed, and 4. mixed), layered homogeneous grain structures could be obtained. The grain sizes are 1-2 orders of magnitude smaller than in conventionally solidified alloys. Tensile testing revealed that the single columnar microstructure provides the most favorable SM-behavior (pseudoelastic deformation  $\leq 7\%$ ). The strength of rapidly cooled materials was higher than that of the same conventionally solidified alloys.

L19 ANSWER 31 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
 ACCESSION NUMBER: 1986:134236 CAPLUS  
 DOCUMENT NUMBER: 104:134236  
 ORIGINAL REFERENCE NO.: 104:21163a,21166a  
 TITLE: Phase transformation in martensite of Cu-12.4% Al  
 AUTHOR(S): Kwarciak, J.; Bojarski, Z.; Morawiec, H.  
 CORPORATE SOURCE: Inst. Phys. Chem. Met., Silesian Univ., Katowice, 40-007, Pol.  
 SOURCE: Journal of Materials Science (1986), 21(3), 788-92  
 CODEN: JMTSAS; ISSN: 0022-2461  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English

AB Phase transformations in a Cu-Al alloy [12608-84-3] which was in the martensitic state were examined by DTA. The influence of the speed of temperature changes on the character of the phase transformation was determined

The new sequence of phase transformations in martensite is discussed and related to the phys. properties (the shape memory effect). Characteristic temps. and heats of transformation in the alloy are estimated

L19 ANSWER 32 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1986:38149 CAPLUS

DOCUMENT NUMBER: 104:38149

ORIGINAL REFERENCE NO.: 104:6195a,6198a

TITLE: Rapidly quenched shape-memory alloys

AUTHOR(S): Eucken, Stephan; Hornbogen, Erhard

CORPORATE SOURCE: Inst. Werkst., Ruhr-Univ. Bochum, Bochum, D-4630, Fed. Rep. Ger.

SOURCE: Rapidly Quenched Met., Proc. Int. Conf., 5th (1985), Meeting Date 1984, Volume 2, 1429-34. Editor(s): Steeb, Siegfried; Warlimont, Hans. North-Holland: Amsterdam, Neth.

CODEN: 54GUAD

DOCUMENT TYPE: Conference

LANGUAGE: English

AB An exploratory study was performed of rapidly quenched Cu- and Ni-base alloys which have shape memory. Rapid quenching leads to an extension of the range of solubility and the martensite temps. In addition to strengthening by an ultrafine grain microstructure, this effect makes it likely that the range of available shape-memory alloys can be largely extended.

L19 ANSWER 33 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1985:545820 CAPLUS

DOCUMENT NUMBER: 103:145820

ORIGINAL REFERENCE NO.: 103:23311a,23314a

TITLE: Kinetics of  $\beta_1$ -phase formation and shape memory in a copper-12.4% aluminum alloy

AUTHOR(S): Bojarski, Z.; Morawiec, H.; Matyja, P.

CORPORATE SOURCE: Inst. Fiz. Chem. Met., Univ. Slaski, Katowice, Pol.

SOURCE: Konf. Metalozn., [Mater. Konf.], 11th (1983), 235-8. Editor(s): Truszkowski, Wojciech. Stowarzyszenie Inz. Tech. Przem. Hutn.: Katowice, Pol.

CODEN: 54ARA8

DOCUMENT TYPE: Conference

LANGUAGE: Polish

AB An increase in heating rate in the range 0.5-25%/min shifts the martensitic phase to ordered  $\beta_1$ -transition to higher temps. and increases the degree of shape recovery. The phase transformations were studied by x-ray diffraction  $<600^\circ$ .

L19 ANSWER 34 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1985:83059 CAPLUS

DOCUMENT NUMBER: 102:83059

ORIGINAL REFERENCE NO.: 102:12987a,12990a

TITLE: Functional copper alloys and their uses

PATENT ASSIGNEE(S): Sumitomo Electric Industries, Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 3 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 59179771	A	19841012	JP 1983-57083	19830330
PRIORITY APPLN. INFO.:			JP 1983-57083	19830330

AB The Cu alloys contain Al 9-15 and optionally Ni  $\leq$ 10%. A  $\beta$ -brass type structure single crystal as martensite or austenite is compressed along [001] direction and heated at a temperature equal to or greater

than the reverse transformation point. They have shape memory, superelastic, or vibration-damping effects. Thus, a Cu alloy [11146-00-2] rod containing Al 14.8% was produced along the axis by the Bridgmann process, and water quenched from 750°. It was compressed by 7% and heated at 70° by an elec. current to be in the original form.

L19 ANSWER 35 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1984:196251 CAPLUS

DOCUMENT NUMBER: 100:196251

ORIGINAL REFERENCE NO.: 100:29793a,29796a

TITLE: The effect of processing conditions and subsequent heat treatment on the transformation behavior of some rapidly solidified copper-base shape memory alloys

AUTHOR(S): Wood, J. V.; Shingu, P. H.

CORPORATE SOURCE: Fac. Technol., Open Univ., Milton Keynes, MK7 6AA, UK  
SOURCE: Metallurgical Transactions A: Physical Metallurgy and Materials Science (1984), 15A(3), 471-80

CODEN: MTTABN; ISSN: 0360-2133

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Microstructure and phase transformation were investigated for: (a) Cu-11.6% Al [12608-84-3]; (b) Cu-(11.7-14.4)Al-(3.0-4.2%)Ni [85109-65-5]; (c) Cu-12.0Al-3.7Ni-2.65Ti-0.15% B [89559-09-1]; and (d) Cu-11.6Al-4.2% Ti [89559-10-4]. The alloys were processed by chill block melt spinning and planar flow casting in a range of processing conditions, to observe how these affected the subsequent transformation. The high transformation temps. of Cu-Al alloys made them unsuitable for monitoring the effect of process conditions. The Cu-Al-Ni alloys were sensitive to both wheel material and provision of secondary quenching. Some alloys containing Ti did not exhibit a shape memory phenomenon after rapid quenching. Heat treatment of alloys in the  $\beta$ - and  $\beta$ 1-phase fields was evaluated. In the  $\beta$ 1-phase, stabilization of transformation temps. could be obtained  $<300^{\circ}$ . The effect of low stress on microstructure was monitored in a thermomech. analyzer.

L19 ANSWER 36 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1984:107688 CAPLUS

DOCUMENT NUMBER: 100:107688

ORIGINAL REFERENCE NO.: 100:16339a,16342a

TITLE: Shape-memory and phase

AUTHOR(S): transformations in a Cu-12.4 weight% Al alloy  
Bojarski, Zbigniew; Morawiec, Henryk; Matyja, Przemyslaw; Lelatko, Jozef; Rasek, Jozef

CORPORATE SOURCE: Inst. Fiz. Chem. Met., Univ. Slaska, Katowice, 40-007, Pol.

SOURCE: Archiwum Nauki o Materialach (1983), 4(2), 93-111  
CODEN: ANAMDU; ISSN: 0138-032X

DOCUMENT TYPE: Journal

LANGUAGE: Polish

AB Pseudoelasticity and 1-directional shape-memory effect were studied in Cu-12.4 weight% Al [12608-84-3]. A martensitic structure of platelets exhibited stacking faults ending with dislocations and also long-range ordering. The temperature associated with shape recovery coincided with the beginning of eutectoid decomposition of the  $\beta_1$ -phase. With increasing annealing temperature, existence of the  $\beta_1$ -phase was shortened, and the degree of shape recovery increased. Cyclic deformation caused a gradual closing of the stress-strain curve to give a completely closed loop. Therefore, martensitic pseudoelasticity took place.

L19 ANSWER 37 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1984:90037 CAPLUS  
DOCUMENT NUMBER: 100:90037  
ORIGINAL REFERENCE NO.: 100:13611a,13614a  
TITLE: Thermally treating heat recoverable metallic articles  
INVENTOR(S): Delaey, Luc; Van Humbeeck, Jan  
PATENT ASSIGNEE(S): Leuven Research and Development VZW, Belg.  
SOURCE: Eur. Pat. Appl., 30 pp.  
CODEN: EPXXDW  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 2  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 95798	A1	19831207	EP 1983-200677	19830511
EP 95798	B1	19870408		
R: AT, BE, CH, DE, FR, GB, IT, LI, LU, NL, SE				
NL 8201986	A	19831201	NL 1982-1986	19820513
AT 26468	T	19870415	AT 1983-200677	19830511
PRIORITY APPLN. INFO.:			NL 1982-1986	A 19820513
			NL 1982-3120	A 19820805
			EP 1983-200677	A 19830511

AB Heat treatment for shape-memory alloys (especially the Cu-base alloys containing Zn and/or Al) is made to stabilize temps. of transformation when the alloys are maintained in the martensitic state. The concentration of lattice vacancies in the  $\beta$ -phase is lowered by a factor of  $\geq 100$ , and the low concentration is then maintained in the martensitic state. The stabilized alloys are suitable as the actuators for temperature control. Thus, the Cu alloy [85109-57-5] strip containing 20.5 Zn and 6% Al (with martensitic transformation at .apprx.60°) was annealed at 750° to the  $\beta$ -phase, quenched in a hot oil bath at 250° for 5 min, further quenched to 80° and held for 2 h, and cooled to room temperature. When reheated to 55° for 90 days, the change in the transformation temperature was 12°, compared with 28° in 30 days for conventional direct quenching to 80°.

L19 ANSWER 38 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1984:38227 CAPLUS  
DOCUMENT NUMBER: 100:38227  
ORIGINAL REFERENCE NO.: 100:5869a,5872a  
TITLE: Transformation characteristics of rapidly solidified shape-memory alloys  
AUTHOR(S): Wood, J. V.  
CORPORATE SOURCE: Fac. Technol., Open Univ., Milton Keynes, MK7 6AA, UK  
SOURCE: Chem. Phys. Rapidly Solidified Mater., Proc. Symp. (1983), Meeting Date 1982, 79-94. Editor(s): Berkowitz, B. J.; Scattergood, R. O. Metall Soc. AIME: Warrendale, Pa.  
CODEN: 50RTA5  
DOCUMENT TYPE: Conference

LANGUAGE: English  
AB Melt spinning and planar flow casting were used to produce rapidly solidified Cu shape-memory alloys with reliable transformation characteristics. A range of processing conditions including provision of a secondary quench were used. The transformation characteristics of Cu-11.6%Al [12608-84-3] and Cu-Ni-Al [85109-65-5] alloys are described. The effect of grain size, aging, and low stresses on the transition behavior was measured. Various mechanisms to account for the data are discussed. Information is provided on how reliable shape-memory alloys produced by rapid solidification and stabilized by aging are obtained.

L19 ANSWER 39 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1983:562599 CAPLUS

DOCUMENT NUMBER: 99:162599

ORIGINAL REFERENCE NO.: 99:24881a,24884a

TITLE: Effect of rapid solidification processing on transformation characteristics of shape-memory alloys

AUTHOR(S): Wood, J. V.

CORPORATE SOURCE: Fac. Technol., Open Univ., Milton/Keynes, UK

SOURCE: Phase Transform. Cryst. Amorphous Alloys, [Pap. Discuss. Meet.] (1983), Meeting Date 1982, 9-22.

Editor(s): Mordike, Barry L. Dtsch. Ges. Metallkd.: Oberursel, Fed. Rep. Ger.

CODEN: 50EAAJ

DOCUMENT TYPE: Conference

LANGUAGE: English

AB Shape-memory Cu alloys were fabricated by rapid solidification processing. To obtain reproducible transformation characteristics, it was necessary to use either high quenching rates or some form of secondary quenching. Heat treatment below 300° promoted stable structures which displayed known transformation temps. Higher annealing temps. resulted in a loss of memory behavior.

L19 ANSWER 40 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1983:475305 CAPLUS

DOCUMENT NUMBER: 99:75305

ORIGINAL REFERENCE NO.: 99:11609a,11612a

TITLE: Effect of heating rate of martensite on the memory effect in the copper-12.4% aluminum alloy

AUTHOR(S): Bojarski, Zbigniew; Morawiec, Henryk; Matyja, Przemyslaw

CORPORATE SOURCE: Inst. Phys. Chem. Met., Silesian Univ., Katowice, Pol.

SOURCE: Archiwum Hutnictwa (1983), 28(1), 41-7

CODEN: AHUTA4; ISSN: 0004-0770

DOCUMENT TYPE: Journal

LANGUAGE: Polish

AB After quenching from a high-temperature, the  $\beta$ -phase in Cu-12.4% Al [12608-84-3] had a  $\beta$ 1'-martensitic structure and displayed the shape memory effect. The shape recovery degree increased with increasing heating rate of deformed specimens. High-temperature x-ray exams. enabled study of reversibility of the martensitic transformation under condition of avoiding the eutectoid reaction. The sequence of phase transformations was independent of heating rate. Irresp. of the heating rate, the temperature for shape recovery corresponded to that for transformation of the  $\beta$ 2-phase to the  $\alpha$  +  $\gamma$ 2 eutectoid.

L19 ANSWER 41 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN

ACCESSION NUMBER: 1983:475228 CAPLUS

DOCUMENT NUMBER: 99:75228

ORIGINAL REFERENCE NO.: 99:11597a,11600a  
TITLE: The relation between the martensite retransformation rate and shape memory in copper 12.4%aluminum alloy  
AUTHOR(S): Bojarski, Z.; Morawiec, H.; Matyja, P.  
CORPORATE SOURCE: Inst. Phys. Chem. Met., Silesian Univ., Katowice, 40-007, Pol.  
SOURCE: Crystal Research and Technology (1983), 18(7), K86-K89  
DOCUMENT TYPE: Journal  
LANGUAGE: English

AB Increasing the reheating rate of Cu-12.4% Al alloy [12608-84-3] increased the % shape recovery. Increasing the isothermal annealing temperature increased the rate of matrtenite transformation to  $\beta$ 1-phase and shape recovery. Increased shape recovery correlated with a decrease in eutectoid decomposition

L19 ANSWER 42 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1983:411839 CAPLUS  
DOCUMENT NUMBER: 99:11839  
ORIGINAL REFERENCE NO.: 99:1867a,1870a  
TITLE: Kinetics and thermodynamics of the shape memory alloys (Cu93-xZnx)Al7  
AUTHOR(S): Chang, C. K.; Kum, C.; Suh, I. H.; Yoon, W. J.; Oh, H. P.  
CORPORATE SOURCE: Coll. Sci., Chungnam Natl. Univ., Chungnam, S. Korea  
SOURCE: Reports of the Research Institute of Chemical Spectroscopy, Chungnam National University (1981), 2, 32-43  
CODEN: RICUDC  
DOCUMENT TYPE: Journal  
LANGUAGE: Korean

AB In order to get basic thermodn. informations about shape-memory alloys, the samples of (Cu93-xZnx)Al7, were prepared in Ar gas at 1150°. The investigations for d., sp. heat, latent heat, entropy, activation enthalpy, shape memory effect, phase transformation temperature, crystal structure, and kinetics revealed the following: (1) these shape-memory alloys have one way memory character and 99 % recovery; (2) they have body-centered tetragonal structure below As points and body-centered cubic structure above Af points; (3) the phase-transformation temps. are directly proportional to the Zn content; (4) the densities are .apprx.8.1 g/cm3; sp. heat, 0.1 cal/g; latent heat, 5 cal/g; entropy, .apprx.0.016 cal/gK, and activation enthalpy, 32.75 kcal/mol.

L19 ANSWER 43 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1983:184073 CAPLUS  
DOCUMENT NUMBER: 98:184073  
ORIGINAL REFERENCE NO.: 98:27925a,27928a  
TITLE: Shape memory effect in copper-aluminum alloys  
AUTHOR(S): Chang, C. K.; Kum, C.; Suh, I. H.; Yoon, W. J.; Oh, H. P.  
CORPORATE SOURCE: Daeduck, S. Korea  
SOURCE: Haksul Yonguchi - Chungnam Taehakkyo, Chayon Kwahak Yonguso (1981), 8(1), 41-45  
CODEN: HYCYDQ; ISSN: 0253-6285  
DOCUMENT TYPE: Journal  
LANGUAGE: Korean

AB The shape recovery process and percentage recovery in Cu-Al alloys containing 10.8-15% Al were measured as a function of temperature at 450-750°. The

alloys show a 1-way memory effect and .apprx.40% recovery.

L19 ANSWER 44 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1983:130712 CAPLUS  
DOCUMENT NUMBER: 98:130712  
ORIGINAL REFERENCE NO.: 98:19857a,19860a  
TITLE: Rapid solidification processing of copper-base memory alloys  
AUTHOR(S): Wood, J. V.  
CORPORATE SOURCE: Fac. Technol., Open Univ., Milton Keynes, UK  
SOURCE: Journal de Physique, Colloque (1982), (C-4), 755-60  
CODEN: JPQCAK; ISSN: 0449-1947  
DOCUMENT TYPE: Journal  
LANGUAGE: English

AB An investigation in the effect of melt spinning variables and subsequent heat treatments on Cu-Ni-Al shape memory alloys was made. Transformation temps. for a wide range of alloys were measured by DSC. Heat treatments <300° result in a stabilization of transformation temps., whereas those above give rise to extensive precipitation and gradual fading of the reversible martensite reaction.

L19 ANSWER 45 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1982:185966 CAPLUS  
DOCUMENT NUMBER: 96:185966  
ORIGINAL REFERENCE NO.: 96:30587a,30590a  
TITLE: Heat treatment of copper-base alloys  
PATENT ASSIGNEE(S): Sumitomo Chemical Co., Ltd., Japan  
SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.  
CODEN: JKXXAF  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 56166363	A	19811221	JP 1980-69503	19800524
JP 62056229	B	19871125		

PRIORITY APPLN. INFO.: JP 1980-69503 A 19800524

AB The β-brass type Cu alloys are quenched from the β-phase temperature with simultaneous deformation to have shape-memory effect, superplasticity, or vibration damping effect. Thus, cast Cu-14.3% Al alloy [12616-94-3] rod was annealed at 900°, hot-swaged, hot-rolled to obtain a tape, heated at 1000° for 3 min, and cooled with simultaneous rolling to obtain a crack-free specimen having a shape-memory effect.

L19 ANSWER 46 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1982:73106 CAPLUS  
DOCUMENT NUMBER: 96:73106  
ORIGINAL REFERENCE NO.: 96:11973a,11976a  
TITLE: Shape memory effect and phase transformations in a copper-12.4 weight % aluminum alloy  
AUTHOR(S): Bojarski, Z.; Morawiec, H.; Matyja, P.  
CORPORATE SOURCE: Inst. Phys. Chem. Met., Silesian Univ., Katowice, Pol.  
SOURCE: Conference on Applied Crystallography, [Proceedings] (1980), 10th, 207-12  
CODEN: PRCCDX; ISSN: 0208-8584  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB Shape recovery and phase transformation processes during heating of Cu-12.4%Al [12608-84-3] martensitic specimens were investigated

by high-temperature x-ray diffraction. The percentage shape recovery increased with increasing rate of martensitic phase change to the ordered parent phase.

L19 ANSWER 47 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1981:627881 CAPLUS  
DOCUMENT NUMBER: 95:227881  
ORIGINAL REFERENCE NO.: 95:37851a,37854a  
TITLE: Electrolytic deposition of copper-aluminum alloys and certain of their properties  
AUTHOR(S): Gala, J.; Lagiewka, E.; Baranska, J.  
CORPORATE SOURCE: Inst. Phys. Chem. Met., Silesian Univ., Katowice, 40-007, Pol.  
SOURCE: Journal of Applied Electrochemistry (1981), 11(6), 735-41  
CODEN: JAELBJ; ISSN: 0021-891X  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB The process of electrodeposition of Cu-Al alloys from a nonaq. ethylbenzene-toluene bath was studied using an elec. system consisting of 2 independent current circuits to sep. control cathode alloy deposition and anode copper dissoln. The effect of elec. parameters on current efficiency and chemical composition of the Cu-Al alloys was determined, as was the phase composition, microhardness and surface morphol. In alloys containing .apprx.10% Al, the presence of a martensitic  $\beta_1'$  phase was detected. Owing to the very fine-grained structure of the electroplated alloys obtained, no shape memory effect ws observed in Cu microelements with Cu-10.6%Al alloy electroplates.

L19 ANSWER 48 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1981:196223 CAPLUS  
DOCUMENT NUMBER: 94:196223  
ORIGINAL REFERENCE NO.: 94:32063a,32066a  
TITLE: Intermetallic compound shape memory element  
PATENT ASSIGNEE(S): N. V. Philips' Gloeilampenfabrieken, Japan  
SOURCE: Jpn. Tokkyo Koho, 3 pp.  
DOCUMENT TYPE: Patent  
LANGUAGE: Japanese  
FAMILY ACC. NUM. COUNT: 2  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 55019975	B	19800530	JP 1977-113458	19770922
NL 7002632	A	19710827	NL 1970-2632	19700225

PRIORITY APPLN. INFO.: NL 1970-2632 A 19700225  
AB Intermetallic compds.  $Cu_{1-x}Al_x$  ( $x = 0.2-0.28$ ),  $Cu_{1-x}Sn_x$  ( $x = 0.14-0.15$ ), and  $Cu_{1-x}Zn_x$  ( $x = 0.385-0.395$ ) are used as shape memory elements. The intermetallic compds. undergo martensitic transformation to give a crystal with a higher coordination number in cooling below its transition temperature. The shape memory elements are useful in tripping the relay of a heat sensor element in household appliances, etc.

L19 ANSWER 49 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1980:26921 CAPLUS  
DOCUMENT NUMBER: 92:26921  
ORIGINAL REFERENCE NO.: 92:4493a,4496a  
TITLE: Reversible shape change in copper-aluminum alloys

AUTHOR(S): alloyed with nickel and manganese  
Dobrovolskaya, T. L.; Neganov, L. M.; Titov, P. V.;  
Khandros, L. G.  
CORPORATE SOURCE: Inst. Metallofiz., Kiev, USSR  
SOURCE: Fizika Metallov i Metallovedenie (1979), 48(4), 803-6  
DOCUMENT TYPE: Journal  
LANGUAGE: Russian  
AB The conditions of the reversible shape memory effect  
were investigated on Al bronzes Cu-Al-Ni and Cu-Al-Mn after nonuniform  
plastic deformation. The reversible memory effect was associated with the  
regular distribution of the lattice defects and of the residual stresses.

L19 ANSWER 50 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1979:27592 CAPLUS  
DOCUMENT NUMBER: 90:27592  
ORIGINAL REFERENCE NO.: 90:4469a,4472a  
TITLE: Effects of thermomechanical processing on damping  
characteristics of martensitic copper-13.5 weight %  
aluminum alloy for ship silencing application  
AUTHOR(S): Kelly, Edward William  
CORPORATE SOURCE: Nav. Postgrad. Sch., Monterey, CA, USA  
SOURCE: U. S. NTIS, AD Rep. (1977), AD-A053878, 58 pp.  
Avail.: NTIS  
From: Gov. Rep. Announce. Index (U. S.) 1978, 78(16),  
229  
CODEN: XADRCH; ISSN: 0099-8575  
DOCUMENT TYPE: Report  
LANGUAGE: English  
AB Cu-Al alloys have high damping capacity in the martensitic state. The  
specific damping capacity in the  $\gamma$ -martensite of Cu-13.5 weight% Al  
alloy [12616-94-3] varied with grain size. Since platelet  
length increased with increasing grain size while platelet width remained  
relatively invariant, martensitic platelet motion was an active mechanism  
for damping. Several thermomech. processes were explored to determine grain  
size control. Grain nucleation, recrystn., and growth were sensitive to  
the usual parameters of prior strain, strain rate, annealing temperature, and  
annealing time. Severe brittleness, reversible shape  
memory effects, and pseudo-elasticity were encountered.

L19 ANSWER 51 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1976:547607 CAPLUS  
DOCUMENT NUMBER: 85:147607  
ORIGINAL REFERENCE NO.: 85:23639a,23642a  
TITLE: The relationship between stacking fault energy and  
shape memory in primary solid  
solutions  
AUTHOR(S): Brook, G. B.; Iles, R. F.; Brooks, P. L.  
CORPORATE SOURCE: Fulmer Res. Inst., Stoke Poges/Bucks., UK  
SOURCE: Shape Mem. Eff. Alloys, [Proc. Int. Symp.] (1975),  
477-86. Editor(s): Perkins, Jeff. Plenum: New York,  
N. Y.  
CODEN: 33LHA4  
DOCUMENT TYPE: Conference  
LANGUAGE: English  
AB The effects of composition on the shape memory in  
austenitic stainless steels are presented and compared to solid solution  
alloys of Cu. The shape memory effect in austenitic  
stainless steels is not due to the  $\gamma$  to  $\alpha'$  martensitic  
transformation. These steels must be deformed above their Ms (martensite  
start) temps. (which should preferably be  $<-196^\circ$ ) and at the lowest  
temperature possible. Shape memory in austenitic steels is

promoted by increasing the content of elements, such as Cr, Co, Mn, and Si, which decrease the stacking-fault energy of austenite. Shape memory is attributed to the reversal of stacking faults produced by low-temperature deformation. This hypothesis is confirmed by Cu face centered cubic solid solution alloys of low stacking-fault energy which exhibit shape memory.

L19 ANSWER 52 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1976:450385 CAPLUS  
DOCUMENT NUMBER: 85:50385  
ORIGINAL REFERENCE NO.: 85:8151a,8154a  
TITLE: Effect of  $\beta_1$ -phase decomposition on the martensitic transformation in copper-aluminum-cobalt and copper-aluminum alloys having the shape memory effect  
AUTHOR(S): Arbuzov, I. A.; Martynov, V. V.; Titov, P. V.; Khandros, L. G.  
CORPORATE SOURCE: Inst. Metallofiz., Kiev, USSR  
SOURCE: Metallofizika (Akademiya Nauk Ukrainskoi SSR, Institut Metallofiziki) (1975), 62, 54-9  
CODEN: MFIZAC; ISSN: 0368-9662  
DOCUMENT TYPE: Journal  
LANGUAGE: Russian  
AB The effect of Co or Ni addns. to Cu-14.5 weight% Al on the stability of the supercooled  $\beta_1$  phase and its decomposition was studied. Alloying with Co decreased hysteresis during the martensitic transformation and increased the  $\beta_1$  phase stability at 200-250°. Both alloys showed shape memory and superelasticity effects. The hardness was increased more for the Cu-Al alloy than for the Cu-Al-Co alloy.

L19 ANSWER 53 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1972:49086 CAPLUS  
DOCUMENT NUMBER: 76:49086  
ORIGINAL REFERENCE NO.: 76:7929a,7932a  
TITLE: New concept on the shape memory effect in metals and alloys  
AUTHOR(S): Nagasawa, A.  
CORPORATE SOURCE: Fac. Sci., Osaka City Univ., Osaka, Japan  
SOURCE: Physica Status Solidi A: Applied Research (1971), 8(2), 531-8  
CODEN: PSSABA; ISSN: 0031-8965  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
AB The shape-memory effect has been investigated on many materials undergoing the martensite transformation. The expts. described show that metals and alloys such as Co, Ti, Zr, Co-Ni, Cu-Al, Fe-Ni and In-Tl have this effect. From these results and considerations on the plastic deformation of material containing the martensite phase, it is concluded that the shape-memory effect is an inherent thermomech. property of the martensite transformation.

L19 ANSWER 54 OF 54 CAPLUS COPYRIGHT 2009 ACS on STN  
ACCESSION NUMBER: 1972:36822 CAPLUS  
DOCUMENT NUMBER: 76:36822  
ORIGINAL REFERENCE NO.: 76:5959a,5962a  
TITLE: Shaped memory element comprising an intermetallic compound  
PATENT ASSIGNEE(S): N. V. Philips' Gloeilampenfabrieken  
SOURCE: Neth. Appl., 10 pp.  
CODEN: NAXXAN  
DOCUMENT TYPE: Patent

LANGUAGE: Dutch  
FAMILY ACC. NUM. COUNT: 2  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
NL 7002632	A	19710827	NL 1970-2632	19700225
DE 2105555	B2	19791129	DE 1971-2105555	19710206
JP 53043443	B	19781120	JP 1971-8071	19710222
JP 55002467	B	19800121	JP 1977-113457	19770922
JP 55019975	B	19800530	JP 1977-113458	19770922
JP 53149732	A	19781227	JP 1978-46018	19780420
JP 57016178	B	19820403		
JP 57039300	B	19820820	JP 1978-150145	19781206
PRIORITY APPLN. INFO.:			NL 1970-2632	A 19700225

AB Intermetallic compds. having a crystal structure I at and above their characteristic temperature, Tf, and a different, martensitically transformed, densely-packed crystal structure II on cooling below Tf, are suitable for the manufacture of shaped memory elements. The memory phenomenon was generally known to be a characteristic exhibited only by NiTi alloys which have a CsCl type crystal structure. However, a number of other binary alloys, e.g. AuTi, PdTi, AuMn, CuAl, CuSn, CuZn etc., as well as ternary alloys, e.g. PdTiFe, PdTiCo, AuTiFe, CuTiCo, NiTiCu, etc., are among the 23 intermetallic compds. listed as having this property. The range of temps. over which the structural transformation takes place varies from tens to hundreds of degrees depending on the compound. Upper and lower temps. are tabulated for each of the compds. listed. Shaped memory elements made from these intermetallic compds. are used for the fabrication of elec. bulb filaments as well as sensors in thermic safety (protection) apparatus

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